



Models

**Earth-Sun System
Models & Analysis Systems**

Working Draft

Version 3.6 - May 2005

Purpose Statement

This booklet provides reference information about Earth and Earth-Sun system models with a NASA affiliation. For the purposes of this booklet, a NASA affiliation is considered to be either a history of NASA funding or use of NASA science products.

Models in the booklet are categorized as "ESMF" (The Earth System Modeling Framework) or "other NASA-affiliated". These categories are further divided into NASA-led and partner-led subcategories. ESMF is a significant muti-agency effort (funded in part by NASA) to create a modeling framework that enhances interoperability among various Earth system models.

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The NASA Vision

To improve life here,
To extend life to there,
To find life beyond.

The NASA Mission

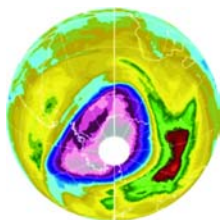
To understand and protect our home planet,
To explore the universe and search for life,
To inspire the next generation of explorers...
as only NASA Can

www.nasa.gov

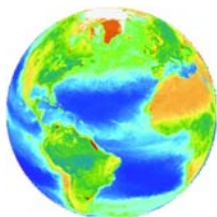
Science Mission Directorate Earth-Sun System Division

Focus Areas

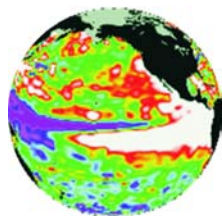
The NASA Earth-Sun Division seeks to develop a scientific understanding of the Earth-Sun system and its response to natural and human-induced changes to enable improved prediction of climate, weather, and natural hazards for present and future generations.



**Atmospheric
Composition**



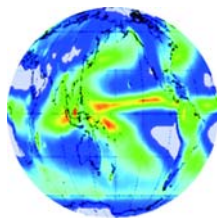
**Carbon Cycle
& Ecosystems**



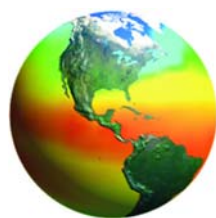
**Climate Variability
& Change**



**Earth Surface
& Interior**



**Water & Energy
Cycle**



Weather



Sun Solar System

Research Strategy

NASA's Earth-Sun System Division is developing a scientific understanding of the Earth-Sun system and its response to natural and human-induced changes to enable improved prediction capability for climate, weather, and natural hazards. The Earth-Sun System Division has an end-to-end strategy to ensure that all the information, understanding, and capabilities derived from its research program achieve maximum usefulness for the scientific and decision-making communities. Increasing our knowledge of the Earth system is the goal of the Earth-Sun System Division's Research Program, which is complemented by the Earth-Sun System Division's Applied Sciences Program and Technology Program.

The Earth-Sun System Division has defined its research strategy around a hierarchy of scientific questions. At the highest level, the Earth-Sun System Division is attempting to provide an answer to one overarching question:

How is the Earth changing and what are the consequences for life on Earth?

The magnitude and scope of this question are too large to allow a simple answer, requiring a lower tier of questions that provide the conceptual approach that the Earth-Sun System Division is taking to improve our knowledge of the Earth system:

Variability: How is the global system changing?

Forcing: What are the primary forcings of the Earth system?

Response: How does the Earth system respond to natural and human-induced changes?

Consequence: What are the consequences of change in the Earth system for human civilization?

Prediction: How well can we predict future changes in the Earth system?

Science Questions

Variability	Forcing	Response	Consequence	Prediction
Precipitation, evaporation & cycling of water changing?	Atmospheric constituents & solar radiation on climate?	Clouds & surface hydrological processes on climate?	Weather variation related to climate variation?	Weather forecasting improvement?
Global ocean circulation varying?	Changes in land cover & land use?	Ecosystem responses & effects on global carbon cycle?	Consequences in land cover & land use?	Transient climate variations?
Global ecosystems changing?	Surface transformation?	Changes in global ocean circulation?	Coastal region change?	Trends in long-term climate?
Stratospheric ozone changing?		Stratospheric trace constituent responses?		Future atmospheric chemical impacts?
Ice cover mass changing?		Sea level affected by climate changes?		Future concentrations of carbon dioxide and methane?
Motions of Earth & interior processes?		Pollution effects?		

- Requires both systematic & exploratory satellites
- Requires systematic satellite observations
- Requires exploratory satellite observations
- Requires pre-operational and/or systematic/exploratory satellites
- Use available/new observations in better models

Applications of National Priority



Agricultural Efficiency



Air Quality



Aviation



Carbon Management



Coastal Management



Ecological Forecasting



Disaster Management



Energy Management



Homeland Security



Invasive Species



Public Health

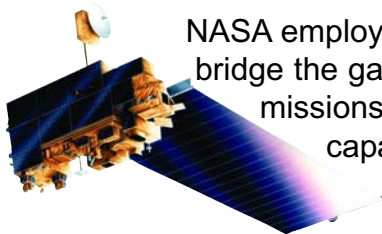


Water Management

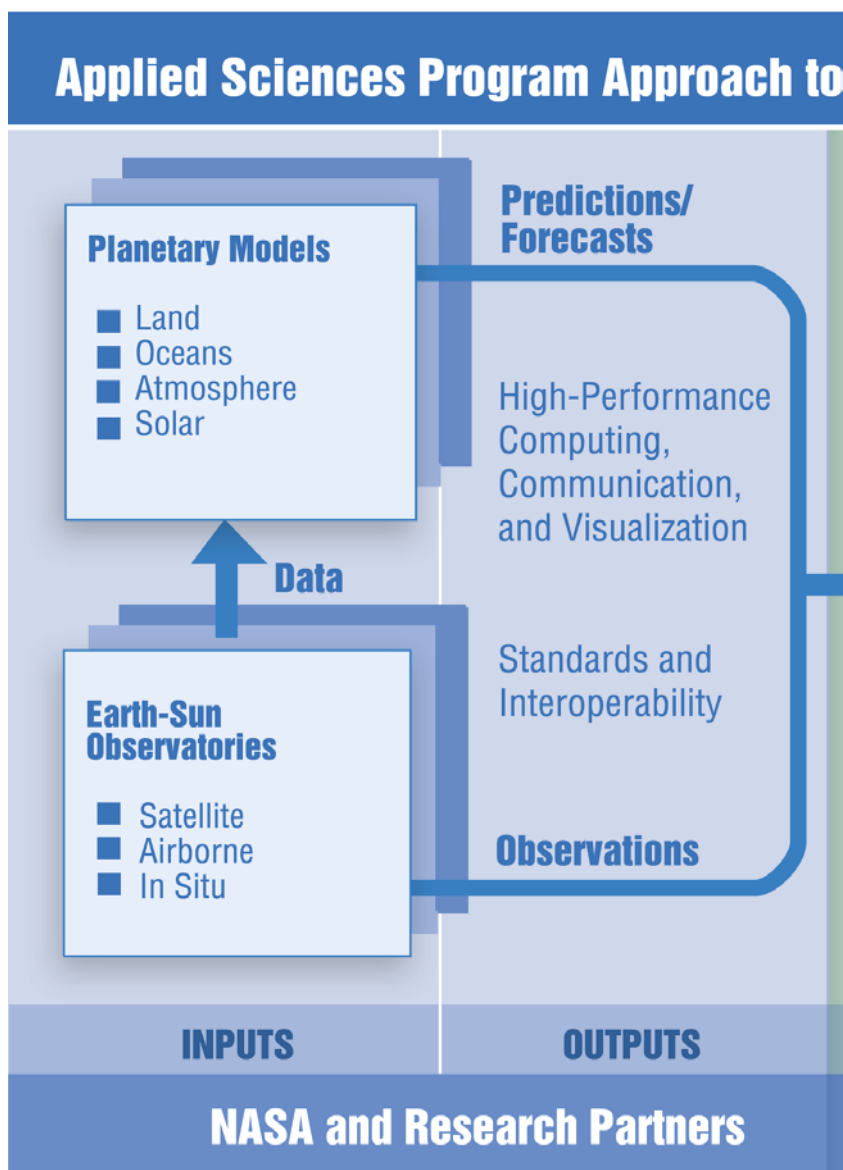
The NASA Applied Sciences Program mission is to expand and accelerate the realization of economic and societal benefits from Earth science, information, and technology. The overarching goal is to bridge the gap between Earth system science research results and the adoption of observations and prediction capabilities for reliable and sustained use in decision support.



Integrated System Solutions Architecture



NASA employs a systems engineering approach to bridge the gap between Earth-Sun system science missions and models. The data and prediction capabilities are adopted for reliable and sustained use in decision support.



Integrated System Solutions

**Partnership
Area**

**Decision-Support
Tools**

- Assessments
- Decision-Support Systems
- Scenario Tools

**Value and
benefits to citizens
and society**

**Policy
Decisions**

**Management
Decisions**

**Exploration
Decisions**

OUTCOMES

IMPACTS

Partners with Decision-Support Tools

Earth System Modeling Framework Overview

- Over the last few years, the need for software infrastructure for Earth system modeling has grown increasingly apparent. Models and the computational platforms that they run on have become extremely complex, leading to excessive time and resources dedicated to solving computational rather than scientific problems.
- The Earth System Modeling Framework (ESMF) collaboration, which consists of Earth scientists and computational experts from major U.S. Earth modeling centers, is developing a robust, flexible set of software tools to enhance ease of use, performance portability, interoperability, and reuse in climate, numerical weather prediction, and data assimilation applications.
 - The ESMF will allow diverse scientific groups to leverage common software to solve routine computational problems such as efficient data communication, model component coupling and sequencing, time management, and parameter specification.
 - In an open dialogue with the broader community, the collaboration will also develop a software interface specification so that groups working at different institutions and in different disciplines can generate interoperable software components.
- The ESMF project is funded by the NASA Earth Science Technology Office (ESTO) Computational Project under the Cooperative Agreement Notice (CAN) entitled: Increasing Interoperability and Performance of Grand Challenge Applications in the Earth, Space, Life and Microgravity Sciences. Funding began February 2002 and will consist of \$10 million over three years.

<http://www.esmf.ucar.edu>

Earth System Modeling Framework Models



NASA-Led



Partner-Led

GMAO Atmospheric Analysis

Purpose: The atmospheric analysis component blends irregularly distributed (in space and time) observations with a regularly gridded model background state to produce a regularly gridded analysis state. This component encompasses the following tasks: (i) converts the gridded background state (forecast model variables) into an analysis background state, (ii) applies appropriate quality control procedures to the input observation streams (i.e. conventional, radiance data), (iii) computes (and saves with associated quality flags) observation-minus-forecast residuals (O-F), (iv) generates analysis increments from O-F using the GMAO general circulation model (GCM) plus GSI algorithm, (v) converts the analysis state back to a gridded state in GCM state variables.

INPUTS

- AMSU-A / AIRABRAD: AMSU-A Calibrated, Geolocated Radiances
- Conventional / Aircraft Flight Level Data
- MODIS / Atmospheric Motion Vectors
- GOES Imager / Atmospheric Motion Vectors
- HIRS / Radiances
- GOES Sounder / Radiances
- Conventional / Rawindsondes
- Conventional / Ship and Buoy Wind, Temp
- TOMS / TOMS: Ozone
- GMAO Atmosphere / Humidity
- GMAO Atmosphere / Meridional wind component
- GMAO Atmosphere / Ozone
- GMAO Atmosphere / Pressure
- GMAO Atmosphere / Temperature
- GMAO Atmosphere / Zonal wind component

Model Platforms

- GSFC SGI Origin 3000 (Daley)

- GSFC Compaq (Halem)

Program Size: Approx. 150,000 lines

Run Time: Approx 5 min. on Halem platform/32pe, at 200km horizontal resolution, 32 levels

Resolution

Temporal: 6-hourly data-ingest and analysis cycle

Vertical: 64 levels (variable)

Horizontal: 0.5 degree (variable)

Range

Temporal: 1979 to present

Vertical: surface to mesosphere

Horizontal: global

Access to model product: GSFC Distributed Active Archive Center (DAAC): <http://daac.gsfc.nasa.gov/>

Validation: Prototype: Wu et al. (2002), Monthly Weather Review

Config Control: GMAO tag #: gmao-gsi_1_0beta2

POC: Ronald Gelaro

Affiliation: NASA Global Modeling and Assimilation Office

Email Address: ron.gelaro@nasa.gov

Phone #: 301-614-6179

Funding: NASA

Contract #: GMAO core funded

Contract Name:

Past Funding:

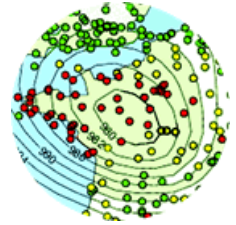
Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: Yes

Website: TBD

Model Partners

• NOAA/NWS/NCEP/EMC



Atmospheric
Analysis

OUTPUTS

- Atmospheric temperature
- Atmospheric pressure
- Humidity
- Wind velocity

Notes:

Information Last Updated: 7/12/2004

GMAO Atmosphere

Purpose: A Unified atmospheric model intended for use in a wide range of applications, including numerical weather prediction, data assimilation, seasonal forecasting, climate prediction, atmospheric chemistry studies, atmosphere land interactions, and coupled ocean-atmosphere modeling.

INPUTS

- HALOE / UARS HALOE Level 3AT Daily Time Ordered Data
- GSFC GOCART / 3-D distribution of each aerosol type
- GSFC GOCART / Absorption
- GSFC GOCART / Aerosol particle size
- GMAO Atmospheric Analysis / Atmospheric pressure
- GMAO Atmospheric Analysis / Atmospheric temperature
- GSFC GOCART / Column burden of individual aerosol species
- GSFC GOCART / Dust emission
- GMAO Atmospheric Analysis / Humidity
- GSFC GOCART / Individual aerosol concentration
- GSFC GOCART / Optical thickness of individual and total aerosols
- GSFC Catchment LSM / Radiation flux
- GSFC GOCART / Radiative forcing
- GMAO Ocean / Sea surface temperature
- GSFC GOCART / Sea-salt emission
- GSFC Catchment LSM / Sensible heat flux
- GSFC GOCART / Single scattering albedo
- GSFC Catchment LSM / Snow depth
- GSFC Catchment LSM / Soil moisture
- GSFC Catchment LSM / Surface evaporation
- GSFC Catchment LSM / surface radiation budget
- GSFC Catchment LSM / Surface temperature
- GSFC GOCART / Total aerosol concentration
- GSFC Catchment LSM / Water balance
- GMAO Atmospheric Analysis / Wind velocity

Model Platforms

- HP Compaq

Program Size: 3.2 MBytes

Run Time: 6 hours

Resolution

Temporal: 30 min

Vertical: 55 layers

Horizontal: adjustable from 50km to 200km

Range

Temporal: days to decades

Vertical: surface to 60 km

Horizontal: Global

Access to model product: <http://gmao.gsfc.nasa.gov/> OR
contact POC

Validation: <http://gmao.gsfc.nasa.gov/>

Config Control: G-Forge at sourcemotel.gsfc.nasa.gov

POC: Max J. Suarez

Affiliation: GMAO

Email Address: max.j.suarez@nasa.gov

Phone #: 301 614 5292

Funding: NASA ESE

Contract #: RTOP-621-85-01

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: Yes

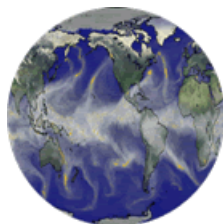
Being Investigated for Use of NASA Data Products as

Input: Yes

Website: <http://gmao.gsfc.nasa.gov/>

Model Partners

• GEST



Atmosphere Model

OUTPUTS

- Dust emission
- Optical thickness of individual and total aerosols
- Column burden of individual aerosol species
- Total aerosol concentration
- Individual aerosol concentration
- 3-D distribution of each aerosol type
- Aerosol particle size
- Absorption
- Single scattering albedo
- Heating / Cooling Rates
- Surface geopotential
- Atmospheric temperature
- Atmospheric pressure
- Precipitation rate
- Total precipital water
- Wind surface stress
- Geopotential height
- Humidity
- Friction velocity
- Boundary layer height
- Cloud cover
- Cloud optical depth
- Wind velocity change rate
- Humidity change rate
- Eddy diffusivity
- Cloud mass flux
- Ozone concentration
- Atmospheric temperature change rate
- Wind velocity
- Surface heat and moisture fluxes

Notes:

Information Last Updated: 6/23/2004

GMAO Ocean Analysis

Purpose: Ocean analyses are primarily conducted for initialization of coupled seasonal-to-interannual forecasts, but also to make a best estimate of the ocean state for climate diagnostic purposes.

INPUTS

- Surface momentum, heat flux and fresh water forcing products
- AVHRR /
- Argo / Salinity profile
- CTD / Salinity profile
- Moored data / Temperature
- Argo / Temperature profile
- XBT / Temperature profile
- CTD / Temperature profile
- GMAO Ocean / 3-D ocean salinity field
- GMAO Ocean / 3-D ocean temperature field
- GMAO Ocean / 3-D ocean velocity components
- GMAO Ocean / Sea surface height

Model Platforms

- HP Compaq

Program Size: 7MB

Run Time: 1.5 hours for OI assimilation on 64 PEs

Resolution

Temporal: Products are generally monthly means; but higher resolution products are also available

Vertical: 27 layers for V4, 34 layers for V5; resolution is spatially variable

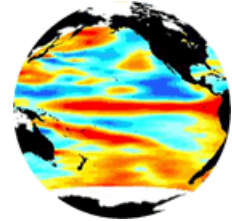
Horizontal: 1/3 deg. latitude X 5/8 deg. longitude

Range

Temporal: 1993 to present, monthly averages

Vertical: surface to 1500m depth

Horizontal: 90S - 72N



Ocean Data
Assimilation System

OUTPUTS

- 3-D ocean temperature field
- 3-D ocean salinity field
- 3-D ocean velocity components
- Sea surface height

Access to model product: please contact the model

Point of Contact

Validation: Keppenne, C.L. and M.M. Rienecker, Monthly Weather Review, V130, 2951-2964, 2002.

Config Control: V4

POC: Michele Rienecker

Affiliation: Code 900.3, NASA/Goddard Space Flight Center

Email Address: Michele.Rienecker@nasa.gov

Phone #: 301-614-6142

Funding: NASA

Contract #: RTOP 622-48-04

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: Yes

Website: http://nsipp.gsfc.nasa.gov/research/ocean/ocean_assim.html

Model Partners

- SAIC

Notes: Multivariate Optimal Interpolation (MVOI) is referenced in: Borovikov, A.Y., M.M. Rienecker, C.L. Keppenne, and G.C. Johnson, Multivariate error covariance estimates by Monte-Carlo simulation for assimilation studies in the North Pacific, Mon. Wea. Rev. (submitted) 2004.

Information Last Updated: 5/10/2004

GSFC Global LIS

Purpose: LIS is a high performance land surface modeling system capable of modeling global and regional land-atmosphere interactions at spatial resolutions down to 1km. LIS is a high-performance version of the Global and North American Land Data Assimilation Systems (LDAS; <http://ldas.gsfc.nasa.gov>) and consists of several land surface models run offline using observationally-based precipitation, radiation and meteorological inputs, and surface parameters.

INPUTS

- Near surface air temperature
- Near surface CO₂ concentration
- Near surface specific humidity
- Near surface wind
- Rainfall
- Surface incident shortwave and longwave radiation
- Surface pressure
- AVHRR / Land Cover Type
- AVHRR / Leaf Area Index
- MODIS / MOD09: Surface Reflectance
- MODIS / MOD10: Snow Cover
- MODIS / MOD11: Land Surface Temperature and Emissivity
- MODIS / MOD12: Land Cover Type
- MODIS / MOD15: Leaf Area Index and Fraction of Photosynthetically Active Radiation
- GOES Imager / Surface Radiation Budget
- NCEP Analysis / All model inputs listed below
- NCEP Atmosphere / All model inputs listed below
- GEOS-4 AGCM / All model inputs listed below
- AGRMET / Surface incident shortwave and longwave radiation

Model Platforms

- SGI IRIX64 6.5
- Linux PC (Intel/AMD based)
- IBM SP2

Program Size: 64MB

Run Time: Depends on resolution/temporal range: seconds to days

Resolution

Temporal: Ranges from 1 second to 3600 seconds

Vertical: Ranges from 5cm to 1 m (thickness of soil layers)

Horizontal: Ranges from 2x2.5 degree to 1 km

Range

Temporal: Ranges from 1 day- years or more

Vertical: Ranges from 1 to 10 m (depth in soil)

Horizontal: Ranges from regional up to 0-360 degrees Longitude, 60S-90N degrees Latitude

Access to model product: please reference <http://lis.gsfc.nasa.gov>

Validation: N/A

Config Control: Version 2.3

POC: Dr. Christa Peters-Lidard

Affiliation: NASA/GSFC Hydrological Sciences Branch

Email Address: christa.peters@nasa.gov

Phone #: 301-614-5811

Funding: NASA

Contract #: GSFC-CT-2

Contract Name:

Past Funding:

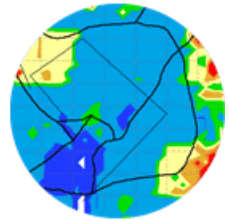
Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: Yes

Website: <http://lis.gsfc.nasa.gov>

Model Partners

- NASA Goddard Space Flight Center Hydrological Sciences Branch
- NOAA National Centers for Environmental Prediction
- Princeton University Department of Civil and Environmental Engineering
- Center for Ocean-Land Atmospheric Studies



Land Surface
Modeling System

OUTPUTS

- Sensible heat flux
- Soil moisture
- Surface temperature
- Radiation flux
- Snow depth
- Water balance
- surface radiation budget
- Energy balance
- Runoff
- Soil Temperature
- Snow water equivalent
- Latent heat flux
- Ground heat flux
- Evapotranspiration
- Evaporation
- Transpiration
- Infiltration

Notes: Future version of the Land Information System with added functionality will be available 9/2004. LIS version 2.3 was released in December of 2003.

Information Last Updated: 3/17/2004

Purpose: Overall goal is to bring ocean state estimation from its experimental status to that of a practical and quasi operational tool for studying large-scale ocean dynamics, designing observational strategies, and examining the ocean's role in climate variability. Our technical goal is the sustained production and evaluation of continuing three-dimensional estimates of the global state of the ocean in near-real time in support of programs such as GODAE and CLIVAR. The main task is to bring together a global GCM with existing global data streams - including TOPEX/POSEIDON and JASON altimeter observations and in situ hydrographic and flow measurements such as what will be available from the ARGO program - to obtain the best possible estimate of the time evolving ocean circulation and related uncertainties.

INPUTS

- AVHRR / AVHRR: Sea Surface Temperature
- CTD / CTD Temperature
- Floats / Floats Temperature
- JMR / Jason: Sea Surface Height
- Moored data / Moorings Temperature
- SeaWinds / SeaWinds: Wind Speed and Direction
- TOPEX/Poseidon / TOPEX: Sea Surface Height
- XBT / XBT Temperature
- NCEP Analysis / All model inputs listed below

Model Platforms

- SGI Origin 2000

Program Size: 19GB runtime memory, 40000 lines of code
Run Time: 6hours on 64cpu SGI Origin 2000 for 1-model year integration

Resolution

Temporal: 1hour, 12hour, 10day, 30day

Vertical: 10m~400m; 10m~500m

Horizontal: 1-deg to 1/3-deg; 1-deg; 2-deg

Range

Temporal: 1993 to present; 1992 to 2002

Vertical: surface to bottom of ocean

Horizontal: 78S to 78N

Access to model product:

<http://www.ecco-group.org>; <http://ecco.jpl.nasa.gov/las>

Validation: See <http://www.ecco-group.org/publications.html>

Config Control: ECCO-1; ECCO-2

POC: Ichiro Fukumori

Affiliation: Jet Propulsion Laboratory

Email Address: fukumori@jpl.nasa.gov

Phone #: 818-354-6965

Funding: NASA, National Oceanographic Partnership Program (NOPP)

Contract #: 622.48.24, 622.50.02, 622.50.01, 622.48.35

Contract Name:

Past Funding:

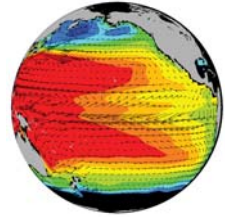
Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: No

Website: www.ecco-group.org

Model Partners

- Massachusetts Institute of Technology
- Scripps Institution of Oceanography, Univ. California San Diego
- Jet Propulsion Laboratory, California Institute of Technology



Ocean State Estimation

OUTPUTS

- 3-D ocean temperature field
- 3-D ocean salinity field
- 3-D ocean velocity components
- Sea surface height
- Ocean bottom pressure
- 3-D mixing tensor

Notes:

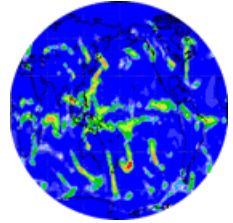
Information Last Updated: 8/30/2004

GFDL FMS B-grid Atmosphere

Purpose: B-Grid is a hydrostatic finite difference model on a staggered Arakawa B grid and hybrid sigma/pressure vertical coordinate. Its purpose is to serve as an atmospheric general circulation model, which can be used as a component of coupled earth-system models.

INPUTS

- Aerosol distribution
- Landcover Type
- Sea ice concentration
- Sea surface temperature
- Soil description
- Column burden of individual aerosol species
- Individual aerosol concentration
- Absorption
- Surface geopotential
- Atmospheric temperature
- Atmospheric pressure
- Precipitation rate
- Total precipital water
- Wind surface stress
- Geopotential height
- Humidity
- Cloud cover
- Wind velocity
- Surface heat and moisture fluxes
- Water vapor mixing ratio
- stratospheric ozone and related trace gases
- Solar flux
- Vegetation description



Atmospheric Science and Climate Research

Model Platforms

- SGI IRIX64
 - SGI Altix
 - Beowulf type cluster
- Program Size: 220,000 lines of code
Run Time: 4.1 model years/day (45 pes, Irix), 5.2 years/day (45 pes, Altix), 1.8 years/day (30pes, Beowulf)
Resolution
Temporal: 30 min
Vertical: 24 levels (variable resolution)
Horizontal: 2.5 long x 2 lat
Range
Temporal: 1860-2300
Vertical: surface - 3.5 hPa
Horizontal: global

Access to model product: <http://nomads.gfdl.noaa.gov>
(on or about 10 December 2004, all IPCC PCMDI data will be available)

Validation: Geophysical Fluid Dynamics Laboratory
Global Atmospheric Model Development Team (2004, J. Climate), in press.

Config Control: am2p13

POC: Venkatramani Balaji

Affiliation: Geophysical Fluid Dynamics Laboratory

Email Address: vb@gfdl.noaa.gov, balaji@princeton.edu

Phone #: 609-452-6516

Funding: NASA (ESMF)

Contract #: CAN-00-OES-01

Contract Name: Earth System Modeling Framework (ESMF)

Past Funding:

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as Input: No

Website: <http://www.gfdl.noaa.gov/~fms>

Model Partners

Notes:

OUTPUTS

- Column burden of individual aerosol species
- Individual aerosol concentration
- Absorption
- Surface geopotential
- Atmospheric temperature
- Atmospheric pressure
- Precipitation rate
- Total precipital water
- Wind surface stress
- Geopotential height
- Humidity
- Cloud cover
- Wind velocity
- Surface heat and moisture fluxes
- Water vapor mixing ratio
- stratospheric ozone and related trace gases

Purpose:

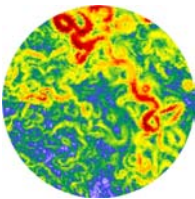
INPUTS

Model Platforms
Program Size:
Run Time:
Resolution
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:

Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as Input: No
Website:
Model Partners

Notes:

Information Last Updated:



Oceanographic and
Climate Research

OUTPUTS

---WAITING ON INPUT---

GFDL MOM4 Ocean

Purpose: The Modular Ocean Model (MOM) is a numerical representation of the ocean's hydrostatic primitive equations, and it is designed primarily as a tool for studying the global ocean climate system. It is developed and supported by researchers at NOAA's Geophysical Fluid Dynamics Laboratory (GFDL), with contributions also provided by researchers worldwide.

INPUTS

- chlorophyll concentrations from the SeaWiFS satellite for the period 1999-2001
- NOAA National Oceanographic Data Center (NODC)

Model Platforms

- SGI IRIX64
- Intel Fortran Compiler
- IBM
- NEC

Program Size: source code: 7.5 megabytes

Run Time: simplest test case, 6 processors: 4.7 sec for 10 model days

Resolution

Temporal: varies, typically from 7200 to 10800 seconds

Vertical: varies, up to 50 vertical levels

Horizontal: varies between 1 and 3 degrees

Range

Temporal: from 1 days to hundreds of years

Vertical: up to 5500 meter depth

Horizontal: global

Access to model product:

<https://fms.gfdl.noaa.gov/account/register.php>

Validation: MOM4 has been used in GFDL IPCC coupled runs and other institutions

Config Control: latest release is mom4p0c (as of 9/17/2004)

POC: Giang Nong

Affiliation: Geophysical Fluid Dynamics Laboratory

Email Address: Giang.Nong@noaa.gov

Phone #: 609-452-6578

Funding: NOAA, NASA (ESMF)

Contract #: CAN-00-OES-01

Contract Name: Earth System Modeling Framework (ESMF)

Past Funding:

Currently Use NASA Data Products as Input: Yes

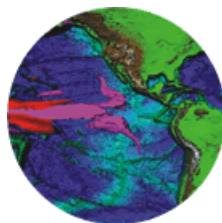
Being Investigated for Use of NASA Data Products as Input: No

Website: <http://www.gfdl.noaa.gov/~fms>

Model Partners

Notes: MOM4 is still in development. A new release of MOM4 (code, data, results) to the public is scheduled once every few months. Please check the MOM4 user's guide (<http://www.gfdl.noaa.gov/~fms>) for the latest development of MOM4.

Information Last Updated: 10/19/2004



Ocean Circulation Model

OUTPUTS

- 3-D ocean temperature field
- 3-D ocean salinity field
- 3-D ocean velocity components
- Sea surface height
- Sea surface temperature
- Ocean bottom pressure
- Sea surface salinity
- Sea salt flux
- Ocean surface current

GMAO Ocean

Purpose: The Poseidon Quasi-isopycnal Ocean Model provides 3-D ocean salinity field, temperature field, 3-D ocean velocity components and sea surface height predictions for use in global ocean state seasonal forecasts, ocean data assimilation, and ocean process studies for short-term climate variability.

INPUTS

- ocean bottom topography
- Surface momentum, heat flux and fresh water forcing products

Model Platforms

- HP Compaq

Program Size: 5.4MB

Run Time: 20 mins wall clock for 1 month simulation on 64 PE's for V4

Resolution

Temporal: monthly means

Vertical: 27 layers for V4, 34 layers for V5

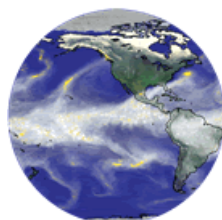
Horizontal: 1/3 deg. latitude X 5/8 deg. longitude

Range

Temporal: 1981 to present

Vertical: upper 1500 m for V4; full ocean depth for V5

Horizontal: South Pole to 72 deg. N



Ocean Model

Access to model product: please contact the model Point of Contact

Validation: Borovikov, A, M.M. Rienecker and P.S. Schopf, J. Climate, V14, 2624-2641, 2001

Config Control: V4 and V5, the latter with full bottom topography

POC: Michele Rienecker

Affiliation: NASA

Email Address: Michele.Rienecker@nasa.gov

Phone #: 301-614-6142

Funding: NASA

Contract #: RTOP 622-24-47

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: Yes

Website: http://nsipp.gsfc.nasa.gov/research/ocean/ocean_descr.html

Model Partners

- George Mason University

OUTPUTS

- 3-D ocean temperature field
- 3-D ocean salinity field
- 3-D ocean velocity components
- Sea surface height

Notes:

Information Last Updated: 5/10/2004

LANL CICE

Purpose: to represent the thermodynamic and dynamic effects of sea ice in global climate modeling systems, for both short- and long-term studies, and at low or high resolution

INPUTS

- Cloud fraction
- Near-surface air temperature
- Near-surface specific humidity
- Near-surface wind
- Precipitation
- Sea surface salinity
- Sea surface temperature
- Solar flux

Model Platforms

- Linux
- IRIX64
- AIX
- Unicos

Program Size: 17 MB including input files and documentation

Run Time: 1.5 min/simulated month for 3 degree global configuration

Resolution

Temporal: varies (typically 0.5 to 4 hours)

Vertical: varies (typically 4 layers ice + 1 layer snow)

Horizontal: varies (0.1 deg to 3 deg or more); includes multiple-category ice thickness distribution (subgrid)

Range

Temporal: unlimited

Vertical: unconstrained

Horizontal: global

Access to model product: Source code available via the CICE website at <http://climate.lanl.gov/Models/CICE/index.htm>.

Validation: eg., Hunke and Ackley (J. Geophys. Res. 106, p 22,373, 2001). See also model documentation included with release and CCSM publications.

Config Control: CICE v3.1

POC: Elizabeth Hunke

Affiliation: Los Alamos National Laboratory

Email Address: eclare@lanl.gov

Phone #: 505-665-9852

Funding: NASA (ESMF)

Contract #: CAN-00-OES-01

Contract Name: Earth System Modeling Framework

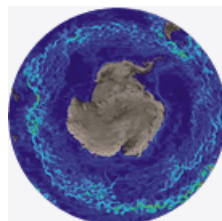
Past Funding:

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as Input: No

Website: <http://climate.lanl.gov/Models/CICE/index.htm>

Model Partners



Sea Ice Model

OUTPUTS

- Snow depth
- Sea ice area fraction
- Sea ice thickness
- Sea ice temperature
- Sea ice velocity
- Surface stresses
- Heat fluxes
- Fresh water fluxes
- Mass fluxes
- Sea ice internal stresses
- Sea ice deformation

Notes: NASA data products used for model validation. Closely associated with sea ice component of NCAR Community Climate System Model (CCSM/CSIM).

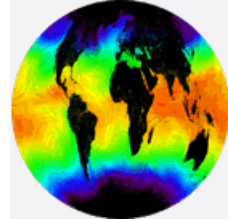
Information Last Updated: 12/6/2004

LANL HYPOP

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:



Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as
Input: No
Website:
Model Partners

**Hybrid Global
Circulation Model**

OUTPUTS

Notes:

Information Last Updated:

—WAITING ON INPUT—

LANL POP Ocean

Purpose: The POP model is used for simulating the global ocean circulation (particularly for use in climate system models), high-resolution eddy resolving simulations, and ocean biogeochemistry. POP is the ocean component of the Community Climate System Model (CCSM).

INPUTS

- Freshwater forcing products
- Ocean bottom topography
- Surface heat flux
- Surface incident longwave radiation
- Surface incident shortwave radiation
- Surface momentum
- LANL CICE / ice fields in coupled model
- NCAR CAM / Surface fields in coupled model

Model Platforms

- AIX
- IRIX64
- OSF1
- Solaris
- Linux.pgi
- Linux.lahey

Program Size: Approx. 50,000 lines of code

Run Time: For 1-degree resolution: 10 simulated years/CPU day on 16 processors of SGI Altix

Resolution

Temporal: Typically 1 hour

Vertical: Typically 40 vertical levels

Horizontal: Typically 1 degree (100 km)

Range

Temporal: 7 minutes to 1 hour

Vertical: Up to 40 vertical levels

Horizontal: 0.1 degree (10 km) to 1 degree (100 km)

Access to model product: Personal contact ; also soon on Earth System Grid (<https://www.earthsystemgrid.org/>).

Validation: Smith, RD, ME Maltrud, FO Bryan, MW Hecht, 2000: Numerical simulation of the North Atlantic Ocean at 1/10 degrees. J. Phys. Oceanogr. 30,1532-61.

Config Control: Version 2.0.1

POC: Phil Jones

Affiliation: LANL

Email Address: pwjones@lanl.gov

Phone #: 505-667-6387

Funding: DOE (CCPP, SciDAC), NASA (ESMF)

Contract #: CAN-00-OES-01

Contract Name: Earth System Modeling Framework

Past Funding:

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as Input: No

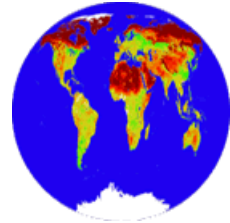
Website: <http://climate.lanl.gov/Models/POP/index.htm>

Model Partners

- NCAR
- Naval Postgraduate School (NPS)

Notes:

Information Last Updated: 2/9/2005



**Global Ocean
Circulation Model**

OUTPUTS

- 3-D ocean temperature field
- 3-D ocean salinity field
- 3-D ocean velocity components
- Sea surface height
- Sea surface temperature
- 3-D mixing tensor
- Sea surface salinity
- Sea salt flux
- Sea ice melting flux
- Ocean surface current

MITgcm Atmosphere

Purpose:

INPUTS

Model Platforms

Program Size:

Run Time:

Resolution

Temporal:

Vertical:

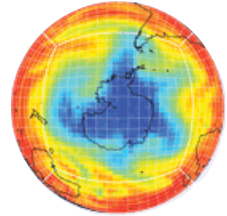
Horizontal:

Range

Temporal:

Vertical:

Horizontal:



**Atmosphere Fluid
Model**

Access to model product:

Validation:

Config Control:

POC:

Affiliation:

Email Address:

Phone #:

Funding:

Contract #:

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as

Input: No

Website:

Model Partners

OUTPUTS

Notes:

Information Last Updated:

—WAITING ON INPUT—

Purpose:

INPUTS

Model Platforms

Program Size:

Run Time:

Resolution

Temporal:

Vertical:

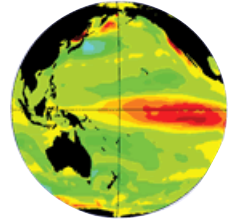
Horizontal:

Range

Temporal:

Vertical:

Horizontal:



Ocean Fluid Model

Access to model product:

Validation:

Config Control:

POC:

Affiliation:

Email Address:

Phone #:

Funding:

Contract #:

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as

Input: No

Website:

Model Partners

OUTPUTS

Notes:

Information Last Updated:

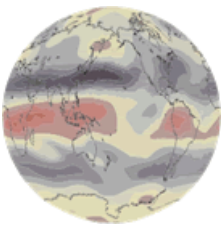
—WAITING ON INPUT—

NCAR CAM

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:



Global Atmosphere
Model

Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as
Input: No
Website:
Model Partners

OUTPUTS

Notes:
Information Last Updated:

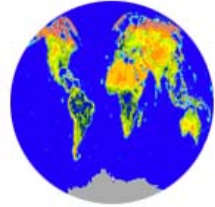
---WAITING ON INPUT---

NCAR CLM

Purpose: The Community Land Model is designed for coupling to atmospheric numerical models to study land-atmosphere interactions. It simulates energy, moisture, and momentum fluxes between land and atmosphere, the hydrologic cycle, and soil temperature. It links photosynthesis, transpiration, and stomatal conductance and simulates the terrestrial carbon cycle and vegetation dynamics. The model has a river routing scheme to transport runoff to the oceans.

INPUTS

- Digital Elevation Model
- Meteorological forcing (from atmospheric model, or reanalysis, or obs network, etc.)
- Soil Hydraulic Properties
- Soil Physical properties
- vegetation and soil description
- MODIS / MOD 12Q1: Land Cover Classification
- MODIS / MOD15: Leaf Area Index and Fraction of Photosynthetically Active Radiation



Energy, Water, Carbon Fluxes

Model Platforms

- IBM SP (AIX)
- CRAY X1 (Unicos)
- INTEL (Linux)
- NEC SX6 (Super-UX)

Program Size: 54,000 lines of code

Run Time: 1.2 seconds per day for a global 2.8 degree grid on bluesky (32 processors) at NCAR Resolution

Temporal: Time step depends on host atmospheric model, but is generally 20-30 minutes

Vertical: 10 soil layers to a depth of 3-4 meters

Horizontal: Global grid (e.g., 2.8 degrees), regional grid (e.g., 10 km), single point

Range

Temporal: Past, present, future climates

Vertical: 10 soil layers to a depth of 3-4 meters

Horizontal: Single column to global grid

Access to model product: Community Climate System Model (CCSM) control runs can be found at:

<http://www.cgd.ucar.edu/csm/>

Validation: A full list of publications is found at the CLM website

Config Control: Community Land Model (CLM 3.0)

POC: Sam Levis

Affiliation: National Center for Atmospheric Research

Email Address: slevis@ucar.edu

Phone #: 303-497-1627

Funding: NASA, NSS, DOE, others

Contract #: NASA ESMF, IDS, LCLUC, Terrestrial Ecology Programs

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: No

Website: <http://www.cgd.ucar.edu/tss/clm/>

Model Partners

- CCSM Land Model Working Group
- LDAS, GLDAS

OUTPUTS

- Soil moisture
- Surface temperature
- Surface evaporation
- Surface albedo
- Surface roughness
- Surface temperature change rate
- Surface type
- Water balance
- Energy balance
- Runoff
- Soil Temperature
- Latent heat flux
- Ground heat flux
- Evapotranspiration
- Evaporation
- Transpiration
- Infiltration
- Land NPP
- Soil trace gas

Notes:

Information Last Updated: 8/30/2004

NCEP Analysis

Purpose:

INPUTS

Model Platforms

Program Size:

Run Time:

Resolution

Temporal:

Vertical:

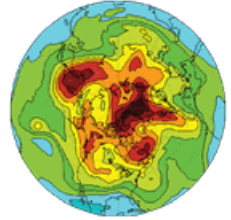
Horizontal:

Range

Temporal:

Vertical:

Horizontal:



Weather and Seasonal

Access to model product:

Validation:

Config Control:

POC:

Affiliation:

Email Address:

Phone #:

Funding:

Contract #:

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as

Input: No

Website:

Model Partners

OUTPUTS

Notes:

Information Last Updated:

—WAITING ON INPUT—

NCEP Atmosphere

Purpose:

INPUTS

Model Platforms

Program Size:

Run Time:

Resolution

Temporal:

Vertical:

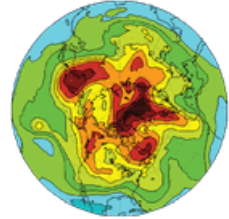
Horizontal:

Range

Temporal:

Vertical:

Horizontal:



Weather and Seasonal Predictions

Access to model product:

Validation:

Config Control:

POC:

Affiliation:

Email Address:

Phone #:

Funding:

Contract #:

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as

Input: No

Website:

Model Partners

OUTPUTS

Notes:

Information Last Updated:

---WAITING ON INPUT---

Purpose: This model is intended for research on numerical weather prediction and as a teaching tool on numerical methods and the general circulation of the atmosphere.

INPUTS

- analyzed/forecasted surface wind, SST and ice products
- Boundary conditions for source gases specified by WMO
- CO emission inventory
- ground saturation
- Landcover Type
- Near surface CO₂ concentration
- NO_x emission inventory
- Sea surface temperatures/sea ice concentration
- skin temperature
- snow depth/cover
- solar flux
- topographic data (DEMs)
- vegetation and soil description
- SeaWinds / SeaWinds: Polar Sea Ice Grids

Model Platforms

- SGI Origin 2000, 3000
- Cray YMP, T3D
- SUN Workstations
- HP Workstations, OSF, LINUX
- IBM SP2, SP3, Workstations

Program Size: More than 30,000 lines of code

Run Time: 34 sec / simulated day for 512 nodes on an SGI 3000

Resolution

Temporal: dynamics: 180 seconds, physics: 60 minute

Vertical: 1 mb, 15, 18, 29,32 levels

Horizontal: 2.4 x 3.0 degrees

Range

Temporal: dynamics 30-450 seconds, physics: 10-60 minutes

Vertical: 1.0 or 100 mb, 9 thru 32 levels

Horizontal: 1.0 thru 5.0 degrees

Access to model product: esm-a.atmos.ucla.edu/~vac

Validation: Mechoso, C. R., J.-Y. Yu and A. Arakawa, 2000: "A Coupled GCM Pilgrimage: From Climate Catastrophe to ENSO Simulations."

Config Control: UCLA Model Version 7.2

POC: Professor Carlos Roberto Mechoso

Affiliation: University of California at Los Angeles

Email Address: mechoso@atmos.ucla.edu

Phone #: 310-825-3057

Funding: NASA, Earth System Modeling Framework (ESMF)

Contract #: CAN-00-OES-01

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as Input: No

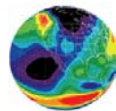
Website: <http://www.atmos.ucla.edu/~mechoso>

Model Partners

Notes: Validation paper featured in General Circulation Model Development: Past, Present and Future Proceedings of a Symposium in Honor of Professor Akio Arakawa. D. A. Randall. Ed., Academic Press, 539-575.

Information Last Updated: 12/6/2004

Finite Difference Global Atmosphere



OUTPUTS

- Single scattering albedo
- Radiative forcing
- Heating / Cooling Rates
- Surface geopotential
- Atmospheric temperature
- Sensible heat flux
- Atmospheric pressure
- Precipitation rate
- Total precipital water
- Soil moisture
- Wind surface stress
- Surface temperature
- Geopotential height
- Humidity
- Surface evaporation
- Radiation flux
- Surface albedo
- Surface roughness
- Boundary layer height
- Cloud cover
- Cloud optical depth
- Ozone concentration
- Surface type
- Wind velocity
- surface radiation budget
- Energy balance
- Soil Temperature
- Ground heat flux
- Evaporation
- Zonal wind
- Meridional wind
- Temperature
- Pressure
- Ozone
- Soil trace gas
- Surface values, fluxes, constituent amounts
- Sea surface temperature
- Surface heat and moisture fluxes
- Water vapor mixing ratio
- Surface upward heat flux (air)
- Surface upward heat flux (water)
- full suite of middle atmosphere chemical species
- stratospheric ozone and related trace gases

Purpose: The Weather Research and Forecast (WRF) is a mesoscale forecast model and assimilation system designed to advance the understanding and prediction of mesoscale precipitation systems to promote ties between the research and operational forecasting communities. WRF is used particularly for treatment of convection and mesoscale precipitation. It is intended for applications with emphasis on horizontal grids of 1-10km. It is expected to replace existing forecast models such as the MM5 at the Pennsylvania State University/National Center for Atmospheric Research, the ETA model at the National Centers for Environmental Prediction, and the RUC system at the Forecast Systems Laboratory.

INPUTS

- Meteorological forcing
- Near surface air temperature
- Near surface wind
- SEA SURFACE TEMPERATURES
- skin temperature
- snow depth/cover
- Soil Hydraulic Properties
- Soil Physical properties
- Surface pressure
- topographic data (DEMs)
- vegetation and soil description
- Radiosonde / Atmospheric Variables
- Temperature Lidar / Temperature
- Air Temp & RH Probe / Temperature and RH profiles
- FSL LAPS / Atmosphere/Land
- WRF 3D VAR / Atmospheric Analyses
- RUC / Atmospheric/land variables
- NCEP Analysis / Atmospheric/land variables

Model Platforms

- IBM
- SUN
- Linux
- SGI
- Dec Alpha
- PC-Intel

Program Size: More than 100,000

Run Time: 1 hour for 48 hour simulation using parameters in note 1

Resolution

Temporal: Seconds to minutes

Vertical: 500 m

Horizontal: 1 to 150 km

Range

Temporal: hours to years

Vertical: 2 mb

Horizontal: Regional (1000's of km)

Access to model product: Available in standard binary output file.

Others can be extracted via code modifications.

Validation: Multiple (http://wrf-model.org/documentation_main.html)

Config Control: Version WRF V2.0.3.1 (released November 2004)

POC: NCAR (<http://box.mmm.ucar.edu/wrf/users/>)

Affiliation: UCAR/NCAR

Email Address: wrfhelp@ucar.edu

Phone #: NA

Funding: Multiple Sources (NOAA, AWFA, NSF, NAVY, NASA)

Contract #: CAN-00-OES-01

Contract Name: Earth System Modeling Framework (ESMF)

Past Funding:

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as Input: Yes

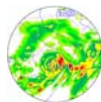
Website: <http://wrf-model.org/>

Model Partners

Notes: 1. Run time given is for a simulation with single grid of dimension 150 x 150 x 28 [y,x,z] grid at 12 km horizontal resolution with a time step of 75 s on a Linux cluster configured with 38 Pentium III 1.0 GHz processors interconnected via a Myrinet fiber optic backbone.

Information Last Updated: 2/9/2005

Weather Research and Forecast Model



OUTPUTS

- Total aerosol concentration
- 3-D distribution of each aerosol type
- Absorption
- Single scattering albedo
- Radiative forcing
- Heating / Cooling Rates
- Surface geopotential
- Atmospheric temperature
- Sensible heat flux
- Atmospheric pressure
- Precipitation rate
- Total precipital water
- Soil moisture
- Wind surface stress
- Surface temperature
- Geopotential height
- Humidity
- Surface evaporation
- Radiation flux
- Surface albedo
- Friction velocity
- Surface roughness
- Boundary layer height
- Surface temperature change rate
- Snow depth
- Cloud cover
- Cloud optical depth
- Wind velocity change rate
- Humidity change rate
- Eddy diffusivity
- Cloud mass flux
- Atmospheric temperature change rate
- Surface type
- Wind velocity
- Water balance
- surface radiation budget
- Energy balance
- Runoff
- Soil Temperature
- Snow water equivalent
- Latent heat flux
- Ground heat flux
- Evapotranspiration
- Evaporation
- Transpiration
- Infiltration
- Land NPP
- Sea surface temperature
- Surface heat and moisture fluxes
- Water vapor mixing ratio
- Snowfall amount
- Momentum flux



NASA-Affiliated Earth-Sun Science Models & Analysis Systems



NASA-Led



Partner-Led



Partner-Led Solar

CASA

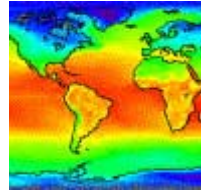
Purpose: To model global terrestrial greenhouse gas emissions

INPUTS

- MODIS / MOD12: Land Cover Type
- MODIS / MOD15: Leaf Area Index and Fraction of Photosynthetically Active Radiation
- NCEP Analysis / All model inputs listed below

Model Platforms

- Unix
Program Size: 4 GB limit
Run Time: 8-12 hours
Resolution
Temporal: Monthly
Vertical: 0
Horizontal: 8 kilometer
Range
Temporal: 1982-2003
Vertical: 0
Horizontal: global



**Net Ecosystem
Production**

Access to model product: <http://geo.arc.nasa.gov/sge/casa/>

Validation: <http://geo.arc.nasa.gov/sge/casa/>

Config Control: Current version V11

POC: Christopher Potter

Affiliation: NASA Ames

Email Address: cpotter@mail.arc.nasa.gov

Phone #: 650-604-6164

Funding: NASA OES

Contract #: 21-291-01-91

Contract Name:

Past Funding: 21-291-01-91

Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: No

Website: <http://geo.arc.nasa.gov/sge/casa/>

Model Partners

- California State University

OUTPUTS

- Surface type
- Water balance
- Evapotranspiration
- Land NPP
- Soil trace gas

Notes:

Information Last Updated:

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:

Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as
Input: No
Website:
Model Partners



Compressive
Modeling of the
Geomagnetic Field

OUTPUTS

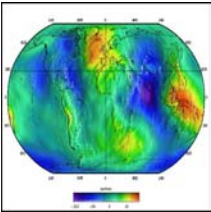
Notes:
Information Last Updated:

---WAITING ON INPUT---

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:



Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as
Input: No
Website:
Model Partners

OUTPUTS

Notes:
Information Last Updated:

---WAITING ON INPUT---

GEOS-4 AGCM

Purpose: Atmospheric component of GEOS-4 assimilation and forecast system. GEOS-4 AGCM is the atmospheric model used at GSFC for data assimilation and for numerical weather prediction. The model can also be used for climate applications and its climate behavior has been well documented in decadal simulations.

INPUTS

- GISS Model III / Atmospheric pressure
- GISS Model III / Humidity
- GISS Model III / Wind velocity

Model Platforms

- SGI Origin
- HP Compaq

Program Size: 5 Mb source code; 4.05 GB minimum RAM for configuration in Note 1

Run Time: 166 simulated days per day with parameters listed in Note 1.

Resolution

Temporal: 30 min

Vertical: 55 levels

Horizontal: 50 km to 200 km

Range

Temporal: Days to decadal

Vertical: surface to 60km

Horizontal: Global

Access to model product: Results at web site

(<http://gmao.gsfc.nasa.gov>) or contact POA.

Validation: <http://gmao.gsfc.nasa.gov>

Config Control: GEOS-4.0.3

POC: Max J Suarez

Affiliation: GMAO

Email Address: max.j.suarez@nasa.gov

Phone #: (301) 614-5355

Funding: NASA Hq ESE

Contract #: RTOP-621-85-01

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: Yes

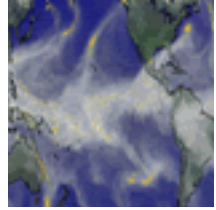
Being Investigated for Use of NASA Data Products as Input: Yes

Website: <http://gmao.gsfc.nasa.gov>

Model Partners

Notes: Note 1: Model resolution: 1 deg x 1.25 deg x 55 vertical layers with 32 SGI processors

Information Last Updated: 8/30/2004



Atmospheric Forecast and Assimilation

OUTPUTS

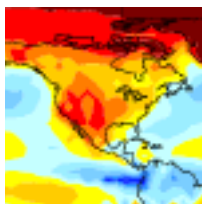
- Surface geopotential
- Atmospheric temperature
- Atmospheric pressure
- Precipitation rate
- Total precipital water
- Soil moisture
- Wind surface stress
- Surface temperature
- Geopotential height
- Humidity
- Radiation flux
- Surface roughness
- Boundary layer height
- Surface temperature change rate
- Snow depth
- Cloud cover
- Cloud optical depth
- Wind velocity change rate
- Humidity change rate
- Eddy diffusivity
- Cloud mass flux
- Atmospheric temperature change rate
- Surface type
- Wind velocity
- Surface heat and moisture fluxes

GISS ModelE

Purpose: ISS ModelE is multi-purpose flexible tool to examine climate change and interactions over a wide range of space and time-scales. Multiple resolutions, different stratospheric and ocean treatments, and varied tracer submodules (including atmospheric chemistry, aerosols (including sulfates, nitrates, carbonaceous, dust and sea salt) can be optionally included as required. This model is being used for the GISS contribution to the upcoming IPCC 4th Assessment Report.

INPUTS

- 3D aerosol distribution
- Landcover Type
- Sea surface temperatures/sea ice concentration
- TOA solar forcing
- topographic data (DEMs)
- vegetation and soil description
- SAGE II / Ozone



Earth System
General Circulation
Model

Model Platforms

- SGI
- IBM
- Linux
- Compaq

Program Size: 4x5x20L: 2.6 MB

Run Time: example: ~4 model years/day with parameters listed in note 1

Resolution

Temporal: 30 minute physics time step (but can vary)

Vertical: 12 to 53 atmospheric levels, variable ocean resolution

Horizontal: 8x10, 4x5, 2x2.5

Range

Temporal: Years to Centuries

Vertical: surface to 0.1mb and optionally up to 0.002mb

Horizontal: Global

Access to model product:

<http://www.giss.nasa.gov/tools/modelE>

Validation: Schmidt et al (in preparation - see website)

Config Control: ModelE1

POC: Gavin Schmidt

Affiliation: NASA Goddard Institute for Space Studies

Email Address: gschmidt@giss.nasa.gov

Phone #: 212 678 5627

Funding: NASA

Contract #: RTOP 622-24-01-30

Contract Name:

Past Funding: Multiple awards to present

Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as

Input: No

Website: <http://www.giss.nasa.gov/tools/modelE>

Model Partners

Notes: This is the official GISS successor to the GISS Model II, Model II and Model III series of models incorporating much new physics and tracer sub-modules, more user friendly interfaces and more modern coding practice (including support for OpenMP, MPI and ESMF (soon)).** Note 1 - Model

Parameters for example run time: using the AGCM at 4x5x20L resolution, on a Compaq, using 4 processors

OUTPUTS

- Optical thickness of individual and total aerosols
- Column burden of individual aerosol species
- Total aerosol concentration
- Individual aerosol concentration
- 3-D distribution of each aerosol type
- Absorption
- Heating / Cooling Rates
- 3-D ocean temperature field
- 3-D ocean salinity field
- 3-D ocean velocity components
- Sea surface height
- Surface geopotential
- Atmospheric temperature
- Sensible heat flux
- Atmospheric pressure
- Precipitation rate
- Total precipital water
- Soil moisture
- Wind surface stress
- Surface temperature
- Geopotential height
- Humidity
- Surface evaporation
- Surface albedo
- Friction velocity
- Boundary layer height
- Surface temperature change rate
- Snow depth
- Cloud cover
- Cloud optical depth
- Wind velocity change rate
- Humidity change rate
- Ozone concentration
- Atmospheric temperature change rate
- Wind velocity
- Water balance
- surface radiation budget
- Energy balance
- Runoff
- Soil Temperature
- Snow water equivalent
- Latent heat flux
- Ground heat flux
- Evapotranspiration
- Evaporation
- Transpiration
- Sea surface temperature
- Surface heat and moisture fluxes
- Ocean bottom pressure
- 3-D mixing tensor
- Aerosol radiative forcing
- Water vapor mixing ratio
- Snowfall amount
- Sea surface salinity
- Sea ice area fraction
- Stress at sea ice base
- Momentum flux
- Sea ice melting flux
- Sea ice thickness
- Sea ice temperature
- Sea ice velocity
- Ocean surface current

Information Last Updated: 8/30/2004

GISS II

Purpose: To examine the effects of multiple radiative forcings on long term climate

INPUTS

- 3D aerosol distribution
- Sea surface temperatures/sea ice concentration
- TOA solar forcing
- topographic data (DEMs)
- vegetation and soil description
- SAGE II / Ozone

Model Platforms

- IBM
- SGI

Program Size: 4x5x12L, 7.6 MB

Run Time: single processor, 1 yr/day

Resolution

Temporal: one hour

Vertical: 12 layers

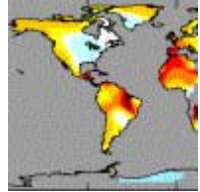
Horizontal: 4x5

Range

Temporal: years to a century

Vertical: surface to 10mb

Horizontal: Global



Global Forcings

Access to model product: <http://www.giss.nasa.gov/data/>

Validation: Hansen et al (1983), Hansen et al (2002)

Config Control: SI2000

POC: Reto Ruedy

Affiliation: SGT Inc.

Email Address: rruedy@giss.nasa.gov

Phone #: 212 678 5600

Funding: NASA

Contract #: RTOP 622-24-01-30

Contract Name:

Past Funding: To 2003

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as Input: No

Website: <http://www.giss.nasa.gov/data/>

Model Partners

OUTPUTS

- Absorption
- Heating / Cooling Rates
- Surface geopotential
- Atmospheric temperature
- Atmospheric pressure
- Precipitation rate
- Total precipital water
- Wind surface stress
- Geopotential height
- Humidity
- Boundary layer height
- Cloud cover
- Cloud optical depth
- Wind velocity change rate
- Cloud mass flux
- Wind velocity
- Surface heat and moisture fluxes
- Water vapor mixing ratio
- Momentum flux

Notes: Data from atmospheric runs including multiple radiative forcings are still available from the SI2000 version of the model (see website), but the model code itself is no longer officially supported. Please see GISS ModelE for more up-to-date model results and capabilities.

Information Last Updated: 8/30/2004

GISS III

Purpose: This model is intended for research requiring finer vertical and horizontal resolution than is generally employed in the GISS climate runs. It is an extension of Model II' (which was an extension of Model II), incorporates the GISS Middle Atmosphere Model and uses some of the new physics routines in Model E (the latest model for primarily tropospheric climate change experiments). It routinely runs with a top at the mesopause, so is appropriate for stratospheric experiments as well as tropospheric ones.

INPUTS

- 3D aerosol distribution
- Radiation, temperature, precip data for validation
- SEA SURFACE TEMPERATURES

Model Platforms

- SGI-TYPE SHARED MEMORY SYSTEM

Program Size: 4x5x53layer: 328 MB; 2X2.5X53layer: 678 MB

Run Time: (4x5x53): 2.25min/day; (2x2.5x53): 20.2 min/day; on

Origin3000@400MHz, 24proc

Resolution

Temporal: 1 hour

Vertical: 500m-1km (53, 102 level versions)

Horizontal: 4°x5° or 2°x2.5°

Range

Temporal: 50 year simulations

Vertical: Surface to 85km

Horizontal: Global

Access to model product: Contact model owner

Validation: NOT YET

Config Control: NA

POC: David Rind; Jeff Jonas

Affiliation: NASA GISS/Columbia University

Email Address: drind@giss.nasa.gov; jonas@giss.nasa.gov

Phone #: 212-678-5593; 212-678-5532

Funding: NASA; Columbia University

Contract #: 622-59-04-30

Contract Name:

Past Funding: MULTIPLE YEAR FUNDING HISTORY

Currently Use NASA Data Products as Input: Yes

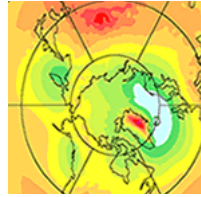
Being Investigated for Use of NASA Data Products as Input: Yes

Website: planned for the future

Model Partners

Notes: Higher resolution models for understanding atmospheric dynamical changes and regional responses related to climate change; also tropospheric and stratospheric tracers and atmospheric chemistry changes associated with altered climate

Information Last Updated:



General Atmospheric and Ocean Circulation Model

OUTPUTS

- Optical thickness of individual and total aerosols
- Absorption
- Single scattering albedo
- Heating / Cooling Rates
- Surface geopotential
- Atmospheric temperature
- Atmospheric pressure
- Precipitation rate
- Total precipital water
- Wind surface stress
- Geopotential height
- Humidity
- Friction velocity
- Boundary layer height
- Cloud cover
- Cloud optical depth
- Wind velocity change rate
- Humidity change rate
- Eddy diffusivity
- Cloud mass flux
- Ozone concentration
- Atmospheric temperature change rate
- Wind velocity

GSFC Aerosol Assimilation System

Purpose:

INPUTS

Model Platforms

Program Size:

Run Time:

Resolution

Temporal:

Vertical:

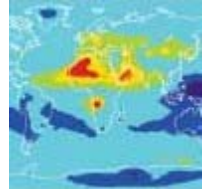
Horizontal:

Range

Temporal:

Vertical:

Horizontal:



Access to model product:

Validation:

Config Control:

POC:

Affiliation:

Email Address:

Phone #:

Funding:

Contract #:

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as

Input: No

Website:

Model Partners

OUTPUTS

Notes:

Information Last Updated:

—WAITING ON INPUT—

GSFC Catchment LSM

Purpose: The Catchment LSM, designed to work with atmospheric GCMs, computes the energy and water balances at the earth's surface. It differs from more traditional land models in its explicit treatment of subgrid soil moisture variability and the impact of this variability on evaporation and runoff.

INPUTS

- Meteorological forcing (from atmospheric model, or reanalysis, or obs network, etc.)
- topographic data (DEMs)
- vegetation and soil description

Model Platforms

- Anything, if run offline (unattached to GCM)
 - HP Compaq (with AGCM)
- Program Size: ~4000 lines of code
Run Time: ~6 sec/year/element, given a 1200 sec time step (alpha processor)
Resolution
Temporal: 20 minute (or shorter) time step
Vertical: three soil moisture prognostic variables
Horizontal: catchments of about 50 km on a side
Range
Temporal: Any time, given availability of boundary condition data
Vertical: vegetation canopy to bedrock
Horizontal: anywhere

Access to model product: Most products are distributed in the form of scientific papers or research reports that provide a description of results. Some side application products are distributed through the GSWP (Global Soil Wetness Project) mostly as meteorological resources.

Validation: Boone et al., J. Climate, 17, pp. 187-208, 2004

Config Control: n/a

POC: Randal Koster

Affiliation: GMAO, NASA/GSFC

Email Address: randal.d.koster@nasa.gov

Phone #: 301-614-5781

Funding: NASA

Contract #: RTOP 51-622-33-88

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: No

Website: http://nsipp.gsfc.nasa.gov/research/land/land_descr.html

Model Partners

- Lamont-Doherty Earth Observatory



Impacts of soil moisture variability on surface fluxes

OUTPUTS

- Sensible heat flux
- Soil moisture
- Surface temperature
- Surface evaporation
- Radiation flux
- Snow depth
- Water balance
- surface radiation budget

Notes: 1. Reference 1: Journal of Geophysical Research, Vol. 105, No. D20, pgs. 24,809-24,822, Oct. 27, 2000

2. Reference 2: Journal of Geophysical Research, Vol. 105, No. D20, pgs. 24,823-24,838, Oct. 27, 2000.

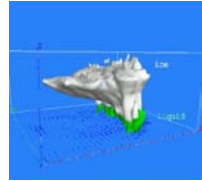
3. NASA data products are not used as model inputs on a regular basis, however, they are occasionally used to outline a research project or define boundary conditions.

Information Last Updated: 8/30/2004

Purpose: The objective is to simulate clouds and cloud systems from various geographic locations that are generally convective in nature in order to: 1) produce a consistent cloud data base for algorithm developers and for large-scale modelers to improve their convective parameterizations, 2) study cloud processes (e.g. microphysical processes) and their interaction with radiation, aerosols, and land and ocean surface processes, 3) perform long term equilibrium state simulations in the tropics, 4) study cloud chemistry and transport, and 5) to serve as a super parameterization within a general circulation model (also known as a multiscale modeling framework or MMF).

INPUTS

- Meteorological forcing (from atmospheric model, or reanalysis, or obs network, etc.)
- Radiosonde / Moisture
- Radiosonde / Pressure
- Radiosonde / Temperature
- Radiosonde / Wind
- GMAO Atmospheric Analysis / Atmospheric pressure
- GMAO Atmospheric Analysis / Atmospheric temperature
- GMAO Atmospheric Analysis / Humidity
- GMAO Atmospheric Analysis / Wind velocity



Non-hydrostatic cloud-resolving model

Model Platforms

- Alpha SC on a Compaq SC45
- SGI Altix 3000

Program Size: 44,000 lines of code

Run Time: 860 s for a 4 h simulation using 64 CPUs, a 256x256x34 domain, and a 10 s time step

Resolution

Temporal: 10 seconds or less

Vertical: stretched: 10 m to 1000 m

Horizontal: 250 m up to 2000 m

Range

Temporal: 12 hours up to multi-week

Vertical: 0 up to 30 km (AGL)

Horizontal: up to several 1000 km

Access to model product: Contact Dr. Tao or Steve Lang via e-mail

Validation: Tao, W.-K., and J. Simpson, 1993: The Goddard Cumulus Ensemble

Model. Part I: Model description. Terr., Atmos. and Oceanic Sci., 4, 35-72.

Config Control: GCE_3D_MPI_V1.0

POC: Steve Lang

Affiliation: SSAI/NASA GSFC

Email Address: lang@agnes.gsfc.nasa.gov

Phone #: 301-614-6331

Funding: NASA

Contract #: 621-15-42, 622-28-04-20, 622-28-03-20, 291-01-97

Contract Name: TRMM/GPM Precipitation Mission, Cumulus

Modeling, Parameterized Convective Processes

Past Funding: 621-30-07 (1993)

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as Input: Yes

Website: None.

Model Partners

- University of Maryland
- University of Virginia
- Columbia University
- University of New York--Albany
- Florida State University
- University of Washington
- Hebrew University of Jerusalem in Israel
- National Central University
- National Taiwan University
- Austin College

OUTPUTS

- Heating / Cooling Rates
- Atmospheric temperature
- Atmospheric pressure
- Precipitation rate
- Total precipital water
- Humidity
- Cloud cover
- Wind velocity change rate
- Humidity change rate
- Cloud mass flux
- Atmospheric temperature change rate
- Wind velocity
- Surface heat and moisture fluxes
- Water vapor mixing ratio
- Momentum flux

Notes: Several national and international universities and research institutions (listed under model partners) are using the GCE model and its results in their research. These professors and researchers are important partners because they can inform us about the model performance. References in addition to the one listed under validation information: Tao, W.-K., J. Simpson, and S.-T. Soong, 1987: Statistical properties of a cloud ensemble: A numerical study. J. Atmos. Sci., 44, 3175-3187.
 Simpson, J., and W.-K. Tao, 1993: The Goddard Cumulus Ensemble Model. Part II. Applications for studying cloud precipitating processes and for NASA TRMM. Terr., Atmos. and Oceanic Sci., 4, 73-116. Tao, W.-K., J. Simpson, D. Baker, S. Braun, M.-D. Chou, B. Ferrier, D. Johnson, A. Khain, S. Lang, B. Lynn, C.-L. Shie, D. Starr, C.-H. Sui, Y. Wang and P. Wetzel, 2003: Microphysics, radiation and surface processes in a the Goddard Cumulus Ensemble (GCE) model, Meteor. and Atmos. Phys., 82, 97-137.
 Tao, W.-K., 2003: Goddard Cumulus Ensemble (GCE) model: Application for understanding precipitation processes, AMS Monographs - Cloud Systems, Hurricanes and TRMM. 1003-138. Juang, H.M., W.-K. Tao, X. Zeng, C.-L. Shie and J. Simpson, 2004: A message passing interface implementation to a cloud-resolving model for massively parallel computing, Mon. Wea. Rev. (submitted).

Information Last Updated: 10/28/2004

GSFC CTM

Purpose:

INPUTS

Model Platforms

Program Size:

Run Time:

Resolution

Temporal:

Vertical:

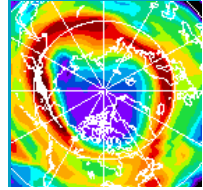
Horizontal:

Range

Temporal:

Vertical:

Horizontal:



Access to model product:

Validation:

Config Control:

POC:

Affiliation:

Email Address:

Phone #:

Funding:

Contract #:

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as

Input: No

Website:

Model Partners

OUTPUTS

Notes:

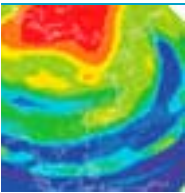
Information Last Updated:

---WAITING ON INPUT---

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:



Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as
Input: No
Website:
Model Partners

OUTPUTS

Notes:
Information Last Updated:

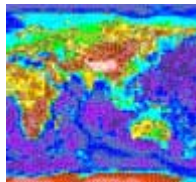
---WAITING ON INPUT---

GSFC GOCART

Purpose: The GOCART model provides predicted values of a number of Earth System parameters (see model products below).

INPUTS

- MODIS / MOD04: Aerosol Product
- GEOS-4 AGCM / Atmospheric pressure
- GEOS-4 AGCM / Atmospheric temperature change rate
- GEOS-4 AGCM / Boundary layer height
- GEOS-4 AGCM / Cloud cover
- GEOS-4 AGCM / Cloud optical depth
- GEOS-4 AGCM / Eddy diffusivity
- GEOS-4 AGCM / Humidity
- GEOS-4 AGCM / Precipitation rate
- GEOS-4 AGCM / Radiation flux
- GEOS-4 AGCM / Soil moisture
- GEOS-4 AGCM / Surface roughness
- GEOS-4 AGCM / Surface temperature
- GEOS-4 AGCM / Surface type
- GEOS-4 AGCM / Wind velocity



Aerosol Transport

Model Platforms

- GSFC NCCS HP-Compaq Alpha Server SC45
- SGI Origin 3000

- Linux (future option)

Program Size: Approximately 300 M Words

Run Time: Example: 12 - 14 min CPU / day with the parameters listed in notes.

Resolution

Temporal: 15 minutes (interpolated) to 6 hour time steps

Vertical: 20 - 55 layers

Horizontal: 1 degree latitude X 1.25 degree longitude (planned to be increased)

Range

Temporal: 1980 - present (+ 5-day projection)

Vertical: Sea Level to 0.001 mbar

Horizontal: global

Access to model product:

<http://code916.gsfc.nasa.gov/People/Chin/aot.html> (or contact model POC)

Validation: <http://code916.gsfc.nasa.gov/People/Chin/jas.all.pdf>

Config Control: Version 3.13 as of 8/19/2003, Model is a research tool/configuration control process required prior to operational use

POC: Mian Chin

Affiliation: GSFC Code 916

Email Address: Mian.Chin-1@nasa.gov

Phone #: 301 614-6007

Funding: NASA

Contract #: 622-58-23, 622-44-01, 621-30-78

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: Yes

Website: <http://code916.gsfc.nasa.gov/People/Chin/aot.html>

Model Partners

OUTPUTS

- Dust emission
- Sea-salt emission
- Optical thickness of individual and total aerosols
- Column burden of individual aerosol species
- Total aerosol concentration
- Individual aerosol concentration
- 3-D distribution of each aerosol type
- Aerosol particle size
- Absorption
- Single scattering albedo
- Heating / Cooling Rates
- Aerosol radiative forcing

Notes: 1. Model parameters for example run time: Model resolution: 2 deg latitude x 2.5 deg longitude, 30 vertical layers. Time steps: 15 min for advection and cloud mixing, 1 hour for emission, chemistry, dry deposition, settling, wet deposition. Number of species (or groups): Dust (5), sea-salt (4), carbonaceous (4), sulfur (4), total 17

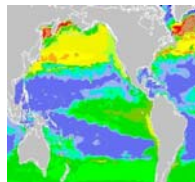
Information Last Updated: 8/30/2004

GSFC Ocean Biology

Purpose: To produce a realistic simulation of ocean biological and biogeochemical processes that can be related to ocean color observations from space and provide improved state and flux estimates.

INPUTS

- MODIS / MOD04: Aerosol Product
- MODIS / MOD21: Chlorophyll a Pigment Concentration
- SeaWiFS / SeaWiFS Level 3 Monthly Data
- TOMS / TOMS: Ozone
- GMAO Ocean Analysis / 3-D ocean temperature field
- GMAO Atmospheric Analysis / Atmospheric pressure
- GSFC GOCART / Dust emission
- GMAO Atmospheric Analysis / Humidity
- GMAO Atmospheric Analysis / Wind velocity



Global ocean biology / biogeochemistry simulation

Model Platforms

- halem
Program Size: 22000
Run Time: 1 hour per simulated month
Resolution
Temporal: 1/2 hr
Vertical: 5 to 200 m
Horizontal: 1 1/4 lon by 2/3 lat
Range
Temporal: years
Vertical: 5000 m
Horizontal: global

Access to model product: contact Model POC

Validation: Gregg, W.W., P. Ginoux, P.S. Schopf, and N.W. Casey, 2003. *See Note 1.

Config Control: NA

POC: Watson Gregg

Affiliation: NASA/Global Modeling and Assimilation Office

Email Address: Watson.Gregg@nasa.gov

Phone #: (301) 614-5711

Funding: NASA

Contract #: 51-621-30-39

Contract Name: Development of an Ocean Biogeochemical EOS Assimilation Model (OBEAM)

Past Funding: 1991 to present, NASA Biogeochemistry Program

Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: No

Website:

Model Partners

OUTPUTS

- chlorophyll
- primary production
- phytoplankton functional
- chlorophyll
- primary production
- phytoplankton functional groups
- carbon flux groups
- carbon flux

Notes:* Note 1: Phytoplankton and Iron: Validation of a global three-dimensional ocean biogeochemical model. Deep-Sea Research II 50: 3143-3169.

Information Last Updated: 10/28/2004

GSFC Ozone Assimilation System

Purpose: This global system assimilates ozone data from multiple satellite-borne sensors into a global three-dimensional stratosphere/troposphere model. The model includes detailed transport and parameterized chemistry processes. The assimilated ozone fields were used in studies of upper atmospheric waves, monitoring and evaluation of retrieved ozone data from satellite instruments, representation of ozone in the lower stratosphere, and evolution of polar ozone. Potential applications include: studies of radiative feedback from ozone in atmospheric general circulation models (GCMs), use as first guess field in retrievals from various satellite instruments, and use in assimilation of radiances from infrared instruments (e.g. TOVS or AIRS). Assimilation of EOS Aura data
will provide tropospheric ozone columns and profiles that could potentially be used for air quality applications.

INPUTS

- MLS / ML2O3: Ozone (O3) Mixing Ratio
- OMI / OMI OMT03: Total Ozone
- SAGE II / Ozone
- SBUV-2 / ozone
- MIPAS / ozone
- POAM III / ozone
- TOMS / TOMS: Ozone
- HALOE / UARS HALOE Level 2 Data
- GMAO Atmospheric Analysis / Atmospheric pressure
- GMAO Atmospheric Analysis / Atmospheric temperature
- GMAO Atmospheric Analysis / Humidity
- GSFC 2D Model / ozone production and loss rates
- GEOS-CHEM / ozone production, loss and dry deposition
- GMAO Atmospheric Analysis / Wind velocity

Model Platforms

- GSFC SGI Origin (Daley)
Program Size: 15000
Run Time: 20 - 40 min
Resolution
Temporal: 15 min to 6 hours
Vertical: 36 levels
Horizontal: 1x1.5 deg to 2x2.5 deg
Range
Temporal: 1991 to present
Vertical: surface to 60 km
Horizontal: global

Access to model product: http://gmao.gsfc.nasa.gov/research/ozone/ozone_assim.php

Validation: Stajner, I. et al. (2001) Q. J. R. Meteorol. Soc., vol. 127; Stajner I. et al. (2004) J. Geophys. Res., Vol. 109

Config Control: CVS at sourcemotel.gsfc.nasa.gov; current tag: hh-cloy

POC: Ivanka Stajner

Affiliation: SAIC and NASA Goddard

Email Address: istajner@gmao.gsfc.nasa.gov

Phone #: (301) 614-6177

Funding: NASA

Contract #: RTOP 622-55-51-20

Contract Name: US OMI science team

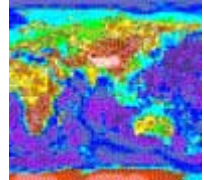
Past Funding:

Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: No

Website:

Model Partners



Assimilation System for Atmospheric Ozone Data

OUTPUTS

- ozone mixing ratio
- Total Ozone Column

Notes:

Information Last Updated:

GSFC 2D Model

Purpose: The model is used to help in understanding and predicting the influence of natural and human-induced influences on stratospheric ozone variation.

INPUTS

- Solar flux
- Source gases
- NCEP Analysis / Atmospheric Temperature
- NCEP Analysis / Geopotential Height

Model Platforms

- Silicon Graphics Origin 200

Program Size: ~10,000

Run Time: ~80 minutes of computer time for one year of model time

Resolution

Temporal: 1 day

Vertical: ~2 km

Horizontal: 10 degrees

Range

Temporal: 1960-2050

Vertical: Ground to 90 km

Horizontal: South pole to North pole



**Two-dimensional
(latitude vs. altitude)
model of the Earth's
atmosphere**

OUTPUTS

- stratospheric ozone and related trace gases

Access to model product: Contact model POC

Validation: Fleming, E. L., C. H. Jackman, J. E. Rosenfield, D. B.

Conside, J. Geophys. Res., 107, D23, 4665,

doi:10.1029/2001JD001146, 2002.

Config Control: Not Applicable

POC: Charles Jackman

Affiliation: NASA Goddard Space Flight Center

Email Address: Charles.H.Jackman@nasa.gov

Phone #: 301-614-6053

Funding: NASA

Contract #: RTOP 622-58-03

Contract Name: ACMAP - Atmospheric Chemistry Modeling and

Analysis Project

Past Funding:

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as Input: No

Website: <http://code916.gsfc.nasa.gov/Public/Modelling/2D/2d.html>

Model Partners

Notes:

Information Last Updated: 11/22/2004

Mosaic LSM

Purpose: This is a well-tested, large-scale soil-vegetation-atmosphere-transfer(SVAT) model for use with atmospheric general circulation models. Vegetation heterogeneity is treated through a tiling approach.

INPUTS

- Meteorological forcing (from atmospheric model, or reanalysis, or obs network, etc.)
- vegetation and soil description

Model Platforms

- Anything, if run offline (unattached to GCM)

Program Size: 2000 lines

Run Time: TBD

Resolution

Temporal: 20 minute (or shorter) time step

Vertical: 3 soil layers, one snow layer

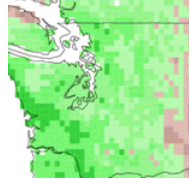
Horizontal: Meant to represent GCM grid element (100s of km)

Range

Temporal: Any time, given availability of boundary condition data

Vertical: vegetation canopy to ~3 meters into soil

Horizontal: anywhere



Energy, Water Flux

OUTPUTS

- Sensible heat flux
- Soil moisture
- Surface temperature
- Surface evaporation
- Surface albedo
- Snow depth
- Water balance
- surface radiation budget

Access to model product: Most products are distributed in the form of scientific papers or research reports that provide a description of results. Some side application products are distributed through the GSWP (Global Soil Wetness Project) mostly as meteorological resources.

Validation: pilps 2c: Wood et al., J. Glob. Planet. Change, 19, pp. 115-135, 1998.

Config Control: n/a

POC: Randal Koster

Affiliation: GMAO, NASA/GSFC

Email Address: randal.koster@gsfc.nasa.gov

Phone #: 301-614-5781

Funding: NASA

Contract #: RTOP 51-622-33-88

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: No

Website: http://nsipp.gsfc.nasa.gov/research/land/land_descr.html

Model Partners

Notes:Reference: NASA Technical Memorandum 104606, Vol. 9.

Current use of NASA data is not checked because NASA data products are not used on a regular basis; they are occasionally used to outline a research project or define boundary conditions.

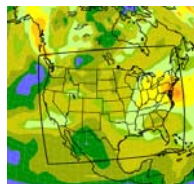
Information Last Updated: 2/19/2004

RAQMS

Purpose: The LaRC/UW Regional Air Quality Modeling System (RAQMS) is a multi-scale meteorological and chemical modeling system for assimilating satellite observations of atmospheric composition and predicting atmospheric trace gas distributions.

INPUTS

- CO emission inventory
- NOx emission inventory
- POAM II / Ozone
- SAGE II / SAGE II: V6.20 Aerosol, O3, NO2, H2O Binary
- SAGE III / SAGE III G3ASSP: L2 Solar Event Species Profile
- TOMS / TOMS: Ozone
- GEOS-4 AGCM / Atmospheric pressure
- GEOS-4 AGCM / Atmospheric temperature
- GEOS-4 AGCM / Humidity
- GEOS-4 AGCM / Wind velocity



Air Quality Model

Model Platforms

- Unix, Linux

Program Size: 1 Gb executable

Run Time: 8 model days/24hr wall clock on dual 3Ghz Linux processors

Resolution

Temporal: 6hr

Vertical: 36 levels (global) / 50 400-m levels (regional)

Horizontal: variable: baseline 2 deg (global) / 80 km (regional)

Range

Temporal: Seasonal

Vertical: 60 km (global) / 20 km (regional)

Horizontal: Global/Contential US

OUTPUTS

- Atmospheric pressure
- Ozone concentration

Access to model product: Products are not distributed through a DAAC. Most are available through Field Mission Data Sets, or through the project itself.

Validation: Pierce, R. B. et al., Regional Air Quality Modeling System (RAQMS) predictions of the tropospheric ozone budget over east Asia, J. Geophys. Res. 108,

Config Control:

POC: Dr. Robert B. Pierce

Affiliation: NASA Langley Research Center

Email Address: Robert.B.Pierce@nasa.gov

Phone #: (757) 864-5817

Funding: NASA

Contract #: 622-59-26-70

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: No

Website: http://asd-www.larc.nasa.gov/new_AtSC/raqms.html

Model Partners

- University of Wisconsin-Madison

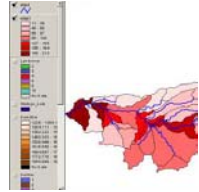
Notes:

Information Last Updated: 6/23/2004

Purpose: Planning and assessment in land and water resource management are evolving from simple, local-scale problems toward complex, spatially explicit regional ones. Such problems have to be addressed with distributed models that can compute runoff and erosion at different spatial and temporal scales. The extensive data requirements and the difficult task of building input parameter files, however, have long represented an obstacle to the timely and cost-effective use of such complex models by resource managers. The USDA-ARS Southwest Watershed Research Center, in cooperation with the U.S. EPA Office of Research and Development, has developed a GIS tool to facilitate this process. A geographic information system (GIS) provides the framework within which spatially-distributed data are collected and used to prepare model input files and evaluate model results.

INPUTS

- Digital Elevation Model
- Landcover Type
- Precipitation
- Soil Hydraulic Properties
- Soil Physical properties
- TM / Land cover
- X-SAR / SRTM



GIS-based hydrologic modeling tool

Model Platforms

- Windows
 - ArcView Spatial Analyst Extension
 - ArcView 3.1 or later
- Program Size: 212kb; with sample data/tutorials 139MB
 Run Time: variable
 Resolution
 Temporal: variable, seconds to minutes
 Vertical: variable, 1cm-1m (soil depth)
 Horizontal: variable, 1m-100m
 Range
 Temporal: variable, minutes to years
 Vertical: variable, 1m-10m (soil depth)
 Horizontal: variable, 100mx100m - 100kmx100km

OUTPUTS

- Runoff
- Infiltration
- Peak flow
- Sediment yield
- Sediment discharge
- ET
- Percolation
- Surface runoff
- Transmission loss
- Water yield

Access to model product: please contact model Point of Contact

Validation:

Config Control: 1.32

POC: Darius Semmons

Affiliation: USDA-ARS

Email Address: agwa@tuscon.ars.ag.gov

Phone #: 520-670-6380 x 163

Funding: USDA, USEPA, USACE

Contract #:

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as Input: Yes

Website: <http://www.tuscon.ars.ag.gov/agwa/>

Model Partners

- USDA
- USEPA

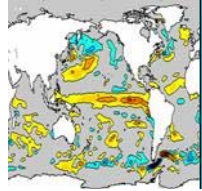
Notes:

Information Last Updated: 5/10/2004

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:



Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as
Input: No
Website:
Model Partners

OUTPUTS

Notes:

Information Last Updated:

—WAITING ON INPUT—

Purpose:**INPUTS**

Model Platforms

Program Size:

Run Time:

Resolution

Temporal:

Vertical:

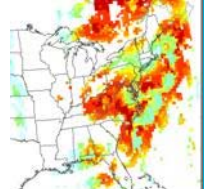
Horizontal:

Range

Temporal:

Vertical:

Horizontal:



Access to model product:

Validation:

Config Control:

POC:

Affiliation:

Email Address:

Phone #:

Funding:

Contract #:

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as

Input: No

Website:

Model Partners

OUTPUTS

Notes:

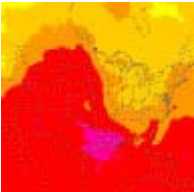
Information Last Updated:

---WAITING ON INPUT---

Purpose:

INPUTS

Model Platforms
 Program Size:
 Run Time:
 Resolution
 Temporal:
 Vertical:
 Horizontal:
 Range
 Temporal:
 Vertical:
 Horizontal:



Access to model product:
 Validation:
 Config Control:
 POC:
 Affiliation:
 Email Address:
 Phone #:
 Funding:
 Contract #:
 Contract Name:
 Past Funding:
 Currently Use NASA Data Products as Input: No
 Being Investigated for Use of NASA Data Products as
 Input: No
 Website:
 Model Partners

OUTPUTS

Notes:

Information Last Updated:

---WAITING ON INPUT---

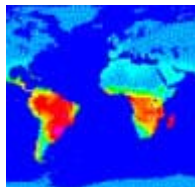
GEOS-CHEM

Purpose: The GEOS-CHEM model is a global three-dimensional model of atmospheric composition driven by assimilated meteorological observations from the Goddard Earth Observing System (GEOS) of the NASA Global Modeling and Assimilation Office (GMAO). GEOS-CHEM is intended for application to a wide range of atmospheric chemistry problems. GEOS-CHEM is also a tool for supporting other activities such as: assessments (Global Modeling Initiative or GMI), satellite retrievals (NASA, CSA, ESA), regional air quality models (Community Multiscale Air Quality Modeling System or CMAQ), data assimilation (GMAO), and climate models (NASA Goddard Institute of Space Studies or GISS).

INPUTS

- GEOS-4 AGCM / Atmospheric pressure
- GEOS-4 AGCM / Atmospheric temperature
- GEOS-4 AGCM / Atmospheric temperature change rate
- GEOS-4 AGCM / Boundary layer height
- GEOS-4 AGCM / Cloud cover
- GEOS-4 AGCM / Cloud mass flux
- GEOS-4 AGCM / Cloud optical depth
- GEOS-4 AGCM / Geopotential height
- GEOS-4 AGCM / Humidity
- GEOS-4 AGCM / Humidity change rate
- GEOS-4 AGCM / Precipitation rate
- GEOS-4 AGCM / Radiation flux
- GEOS-4 AGCM / Snow depth
- GEOS-4 AGCM / Soil moisture
- GEOS-4 AGCM / Surface geopotential
- GEOS-4 AGCM / Surface heat and moisture fluxes
- GEOS-4 AGCM / Surface roughness
- GEOS-4 AGCM / Surface temperature
- GEOS-4 AGCM / Surface temperature change rate
- GEOS-4 AGCM / Surface type
- GEOS-4 AGCM / Total precipital water
- GEOS-4 AGCM / Wind surface stress
- GEOS-4 AGCM / Wind velocity
- GEOS-4 AGCM / Wind velocity change rate

Atmospheric Chemistry



OUTPUTS

- Dust emission
- Optical thickness of individual and total aerosols
- Total aerosol concentration
- Individual aerosol concentration
- 3-D distribution of each aerosol type
- Ozone concentration
- Pressure
- ozone production and loss rates

Model Platforms

- SGI Origin & Power Challenge Cluster
 - SGI Origin
 - Linux PC
 - SunFire 3800 (SPARC)
 - SGI Origin and SC45 Compaq Alpha
 - Sun/SPARC
 - Linux PC (2-processor)
 - Grid of 3 128-node Linux machines
 - Compaq Alpha
 - IBM Workstations
 - SGI Altix / Itanium workstations
- Program Size: 100,000
Run Time: 3.5 hours/month (4 x 5, full-chemistry simulation on Altix)
Resolution
Temporal: 3 hours
Vertical: 20-55 vertical layers
Horizontal: 2 deg latitude x 2.5 deg longitude until end of 1999; 1 deg x 1 deg afterward
Range
Temporal: 1985-present
Vertical: Surface to 80 km
Horizontal: Global

Access to model product: <http://www-as.harvard.edu/chemistry/trop/geos/index.html> (also <http://www-as.harvard.edu/chemistry/trop/geos/geos_gatekeeper.html> for source code and data files)

Validation: See Bey et al 2001: <http://www-as.harvard.edu/chemistry/trop/publications/bey2001a.pdf>

Config Control: v7-01-02

POC: Daniel Jacob

Affiliation: Atmospheric Chemistry Modeling Group, Harvard University

Email Address: djacob@fas.harvard.edu

Phone #: 617-495-1794

Funding: NASA

Contract #: NNG04GA56G

Contract Name: Atmospheric Chemistry Modeling and Analysis Program

Past Funding:

Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: No

Website: <http://www-as.harvard.edu/chemistry/trop/geos/index.html>

Model Partners

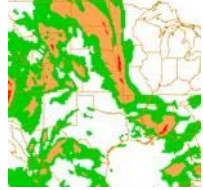
- California Institute of Technology
- Carnegie-Mellon University
- Dalhousie University
- Duke University
- Ecole Polytechnique Federale de Lausanne, Switzerland.
- Georgia Institute of Technology
- University of Houston
- JPL
- University of L'Aquila, Italy
- University of Leeds, UK
- NOAA
- National Institute of Aerospace
- National Observatory of Athens, Greece
- Princeton University
- University of Tennessee
- University of Toronto
- University of Washington

Notes: The run times depend on which kind of simulation you are performing. The most computationally intensive simulation that you can perform is the NO_x-O_x-hydrocarbon-aerosol simulation (aka "full-chemistry" simulation). A "full-chemistry" simulation on the 4 deg lat x 5 deg lon grid takes approximately 3.5 hours/month (SGI Altix). The same run at 2 deg lat x 2.5 deg lon takes about 19 hours/month (also on SGI Altix).

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution:
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:



Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as
Input: No
Website:
Model Partners

OUTPUTS

Notes:

Information Last Updated:

---WAITING ON INPUT---

Hysplit4

Purpose: HYSPLIT 4 is a complete system for computing simple trajectories to complex dispersion and deposition simulations using either puff or particle approaches. The model uses previously gridded meteorological data on a conformal or latitude-longitude map projection. Air concentration calculations associate the mass of the pollutant species with the release of either puffs, particles, or a combination of both. The dispersion rate is calculated from the vertical diffusivity profile, wind shear, and horizontal deformation of the wind field. Air concentrations are calculated at a specific grid point for puffs and as cell-average concentrations for particles.

INPUTS

- Meteorological forcing (from atmospheric model, or reanalysis, or obs network, etc.)

Model Platforms

- Most UNIX systems or Windows

Program Size: 35,000 lines of code

Run Time: 25 sec on an IBM p630 for one 48-h simulation

Resolution

Temporal: 1 minute

Vertical: Particle position in sigma at single precision

Horizontal: Particle position in grid units at single precision

Range

Temporal: User selectable: 1 min to run duration

Vertical: User selectable: 1 m to top of model atmosphere

Horizontal: User selectable: 0.001 deg to 0.5 deg (suggested max)

Access to model product: <http://www.arl.noaa.gov/hysplit.html>

Validation: Draxler and Hess, 1998, Australian Meteorological Magazine, 47:295-308

Config Control: 4.7

POC: Roland Draxler

Affiliation: NOAA Air Resources Laboratory

Email Address: roland.draxler@noaa.gov

Phone #: 1-301-713-0295 x117

Funding: NOAA

Contract #: No current NASA funding

Contract Name:

Past Funding: NRA 98-OES-13

Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: No

Website: <http://www.arl.noaa.gov/ready/hysplit4.html>

Model Partners



Air Trajectories, Pollutant Dispersion, and Deposition

OUTPUTS

- Individual aerosol concentration
- 3-D distribution of each aerosol type
- pollutant air concentrations and deposition

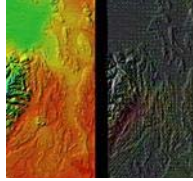
Notes: NASA contract funded development of the ensemble version of HYSPLIT. Current results can be found at <http://www.arl.noaa.gov/data/web/ensemble/>

Information Last Updated: 9/22/2004

Purpose: The PSU/NCAR mesoscale model is a limited-area, nonhydrostatic, terrain-following sigma-coordinate model designed to simulate or predict mesoscale and regional-scale atmospheric circulation. It has been developed at Penn State and NCAR as a community mesoscale model and is continuously being improved by contributions from users at several universities and government laboratories.

INPUTS

- Meteorological forcing (from atmospheric model, or reanalysis, or obs network, etc.)
- skin temperature
- Soil Hydraulic Properties
- Soil Physical properties
- vegetation and soil description
- Radiosonde / Atmospheric Variables
- Temperature Lidar / Temperature
- RUC / Atmospheric/land variables
- NCEP Analysis / Atmospheric/land variables



Mesoscale Meteorology

Model Platforms

- IBM
- SUN
- Linux
- SGI
- DEC Alpha
- PC-Intel

Program Size: More than 100,000

Run Time: 25 minutes for 48 hour simulation using parameters in note 1

Resolution

Temporal: Seconds to minutes

Vertical: 500 m

Horizontal: 1 to 150 km

Range

Temporal: hours to years

Vertical: 50 mb

Horizontal: regional (1000's of km) NOTE: some global apps at NCAR

Access to model product: Many available in standard binary output file. Others can be extracted via code modifications.

Validation: Multiple (see

<http://box.mmm.ucar.edu/mm5/Publications/>)

Config Control: Version 3-6-1 (Released March 4, 2003)

POC: NCAR (<http://www.mmm.ucar.edu/mm5/support.html>)

Affiliation: Mesoscale and Microscale Meteorology Division

Email Address: mesouser@ucar.edu

Phone #: NA

Funding: Multiple Sources (primary NSF)

Contract #:

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: Yes

Website: <http://www.mmm.ucar.edu/mm5/mm5-home.html>

Model Partners

Notes:1. Run time given is for a simulation with a nested configuration (outer domain of 115 x 98 x 27 [y,x,z] grid at 36 km horizontal resolution with a time step of 108 s and a 12 km 73 x 73 x 27 nested inner domain with a time step of 36 s) on a Linux cluster configured with 40 Pentium III 1.0 GHz processors interconnected via a Myrinet fiber optic backbone. More information on MM5 timing can be found at: <http://www.mmm.ucar.edu/mm5/mm5v2/mm5v2-timing.html>

OUTPUTS

- Total aerosol concentration
- 3-D distribution of each aerosol type
- Absorption
- Single scattering albedo
- Radiative forcing
- Heating / Cooling Rates
- Surface geopotential
- Atmospheric temperature
- Sensible heat flux
- Atmospheric pressure
- Precipitation rate
- Total precipital water
- Soil moisture
- Wind surface stress
- Surface temperature
- Geopotential height
- Humidity
- Surface evaporation
- Radiation flux
- Surface albedo
- Friction velocity
- Surface roughness
- Boundary layer height
- Surface temperature change rate
- Snow depth
- Cloud cover
- Cloud optical depth
- Wind velocity change rate
- Humidity change rate
- Eddy diffusivity
- Cloud mass flux
- Atmospheric temperature change rate
- Surface type
- Wind velocity
- Water balance
- surface radiation budget
- Energy balance
- Runoff
- Soil Temperature
- Snow water equivalent
- Latent heat flux
- Ground heat flux
- Evapotranspiration
- Evaporation
- Transpiration
- Infiltration
- Land NPP
- Sea surface temperature
- Surface heat and moistur fluxes
- Water vapor mixing ratio
- Snowfall amount
- Momentum flux

Information Last Updated: 10/28/2004

NCAR TIMEGCM

Purpose: Purpose: Three-dimensional, time-dependent model used to simulate Earth's circulation, temperature, electrodynamics, and compositional structure of the upper atmosphere and ionosphere.

INPUTS

- satellite radiometer / 10 mb ncep lower boundary
- radio antennae / 10.7 cm solar flux
- magnetometer / Kp index

Model Platforms

- IBM-AIX
- SGI-IRIX64
- GNU Linux

Program Size: 70,000

Run Time: 10 minutes per simulated day (5 minute timestep)

Resolution

Temporal: typically 3-5 minute timestep

Vertical: 0.5 or 0.25 ln(p0/p)

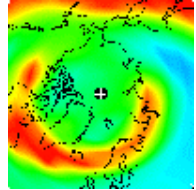
Horizontal: 2.5x2.5 or 5x5 degrees

Range

Temporal: full year runs

Vertical: approx 30-500 km

Horizontal: global



Thermosphere-Ionosphere General Circulation Model

Access to model product: Please contact POC or Ben Foster for history file outputs in netCDF format

Validation: * (see notes below)

Config Control: Version 1 (Version 2 released in Spring 2005)

POC: Ray Roble

Affiliation: NCAR

Email Address: roble@ncar.ucar.edu

Phone #: 303-497-1562

Funding: NASA, National Science Foundation (NSF), Office of Naval Research (ONR)

Contract #: No. S-13, 796-G

Contract Name: Sun-Earth Connection Theory Program

Past Funding:

Currently Use NASA Data Products as Input: Yes

Being Investigated for Use of NASA Data Products as Input: No

Website: <http://www.hao.ucar.edu/public/research/tiso/tgcm/tgcm.html>

Model Partners

OUTPUTS

- Heating / Cooling Rates
- Atmospheric temperature
- Geopotential height
- Wind velocity
- Water vapor mixing ratio
- o2, o, n4s, noz, no, no2, o3, oh, ho2, h, w, ions, etc.

Notes: *See also <<http://www.hao.ucar.edu/public/research/tiso/tgcm/tgcm.html>> and <<http://download.hao.ucar.edu/pub/tgcm/doc/userguide/>> (under construction) Can provide extensive bibliography (e.g., Roble, R.G., et.al.)

Information Last Updated: 11/22/2004

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:



Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as
Input: No
Website:
Model Partners

OUTPUTS

Notes:

Information Last Updated:

---WAITING ON INPUT---

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:



Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as
Input: No
Website:
Model Partners

OUTPUTS

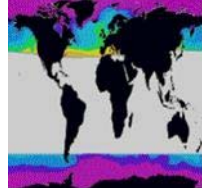
Notes:
Information Last Updated:

----WAITING ON INPUT----

Purpose:

INPUTS

Model Platforms
 Program Size:
 Run Time:
 Resolution
 Temporal:
 Vertical:
 Horizontal:
 Range
 Temporal:
 Vertical:
 Horizontal:



Access to model product:
 Validation:
 Config Control:
 POC:
 Affiliation:
 Email Address:
 Phone #:
 Funding:
 Contract #:
 Contract Name:
 Past Funding:
 Currently Use NASA Data Products as Input: No
 Being Investigated for Use of NASA Data Products as
 Input: No
 Website:
 Model Partners

OUTPUTS

Notes:

Information Last Updated:

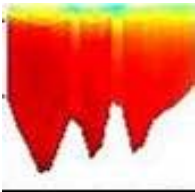
---WAITING ON INPUT---

SMOKE

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:



Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as Input: No
Website:
Model Partners

OUTPUTS

Notes:
Information Last Updated:

---WAITING ON INPUT---

SWAT

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:



Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as
Input: No
Website:
Model Partners

OUTPUTS

Notes:
Information Last Updated:

---WAITING ON INPUT---

WACCM

Purpose: The Whole-Atmosphere Community Climate Model (WACCM) is a comprehensive numerical model, spanning the range of altitude from the Earth's surface to the thermosphere. The development of WACCM is an inter-divisional collaboration that unifies certain aspects of the upper atmospheric modeling of HAO, the middle atmosphere modeling of ACD, and the tropospheric modeling of CGD, using the NCAR Community Climate System Model (CCSM) as a common numerical framework.

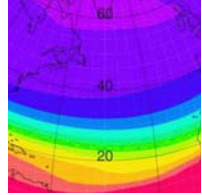
INPUTS

- aerosol distribution
- Boundary conditions for source gases specified by WMO
- Chemical Kinetics and Photochemical Data from the current JPL evaluation
- SEA SURFACE TEMPERATURES
- solar flux

Model Platforms

- IBM Power-4 cluster, running AIX
Program Size: approx. 25,000 lines (see note 2)
Run Time: approx. 1 day / model year on 96 CPUs (12 nodes x 8 processors)
Resolution
Temporal: 15 minutes
Vertical: variable: 1.3-3 km
Horizontal: 2 x 2.5 degrees
Range
Temporal: annual to century-scale climate simulations
Vertical: 0-140 km approx.
Horizontal: global

Access to model product: NCAR/UCAR Community Data Portal:
<https://cdp.ucar.edu/>
Validation: Use of NASA data for validation purposes: UARS and TIMED satellites
Config Control: waccm1b (noninteractive chemistry) currently available
POC: Rolando Garcia
Affiliation: NCAR/ACD
Email Address: rgarcia@ucar.edu
Phone #: 303 497-1446
Funding: NCAR (NSF)
Contract #: not currently NASA funded
Contract Name:
Past Funding: 2001-2003 NRA-00-01-LWS-059
Currently Use NASA Data Products as Input: Yes
Being Investigated for Use of NASA Data Products as Input: No
Website: <http://www.acd.ucar.edu/science/models/WACCM>
Model Partners



Dynamics and Chemistry, Surface to Lower Thermosphere

OUTPUTS

- Heating / Cooling Rates
- Surface geopotential
- Atmospheric temperature
- Atmospheric pressure
- Precipitation rate
- Geopotential height
- Humidity
- Cloud cover
- Ozone concentration
- Wind velocity
- Water vapor mixing ratio
- full suite of middle atmosphere chemical species

Notes: Note 1: NASA data only used for validation purposes. Note 2: 1.5GB per MPI process, running 12 processes on 8 processor nodes.

Information Last Updated: 10/28/2004

WAVEWATCH III

Purpose: This is a generic ocean wave model that runs on nearly all computer architectures. Example applications and source codes can be found at the NOAA/NCEP web site (see below).

INPUTS

- Analyzed / forecasted sea ice products
- Analyzed / forecasted sea surface temperature products
- Analyzed / forecasted surface wind products
- Near-surface wind
- In situ buoys / Wave and wind data
- Altimeter / Wave data
- SAR / Wave spectra

Model Platforms

- UNIX/Linux single processor, OpenMP or MPI

Program Size: 50,000 lines of code, 60% of which is documentation.

Run Time: 30,000 grid point global NCEP model takes 75s per forecast day on 16 IBM power4 processors.

Resolution

Temporal: 1 min to 1 h

Vertical: N/A

Horizontal: 1km to 100 km

Range

Temporal: depends on available forcing only.

Vertical: N/A

Horizontal: Global or regional, depending on resolution

Access to model product: <http://polar.ncep.noaa.gov/waves/products.html>

Validation: <http://polar.ncep.noaa.gov/waves>

Config Control: Version 2.22

POC: Hendrik L. Tolman

Affiliation: SAIC-GSO at NOAA/NCEP

Email Address: Hendrik.Tolman@NOAA.gov

Phone #: 301-763-8133 x 7253

Funding: None

Contract #:

Contract Name:

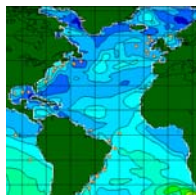
Past Funding: Previous model WAVEWATCH II NASA funded 1990-1992 (NRC Re. Res. Ass.)

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as Input: No

Website: <http://polar.ncep.noaa.gov/waves/wavewatch>

Model Partners



**Generic Ocean Wind
Wave Model**

OUTPUTS

- Significant wave height
- Mean wave length
- Mean wave period
- Mean wave direction
- Sea ice concentration
- Water level
- Peak wave direction
- Peak wave frequency
- Wind sea peak frequency
- Wind sea peak direction
- Mean directional wave energy spread
- Full spectral wave data (at selected output points)

Notes: Due to the nature of the forecast problem, initial conditions are not essential, and hence good forecasts can be achieved without analysis data, provided that the model provides its own initial conditions for continuity, and that it has spun up for a sufficient period (hours for small scale applications to several weeks for Pacific applications).

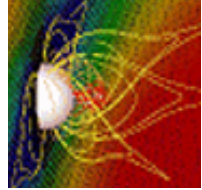
Information Last Updated: 10/28/2004

BATS-R-US EEG

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:



Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as
Input: No
Website:
Model Partners

OUTPUTS

Notes:

Information Last Updated:

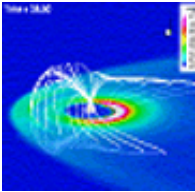
—WAITING ON INPUT—

BATS-R-US GM

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:



Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as
Input: No
Website:
Model Partners

OUTPUTS

Notes:
Information Last Updated:

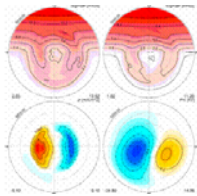
—WAITING ON INPUT—

BATS-R-US IE

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:



Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as
Input: No
Website:
Model Partners

OUTPUTS

Notes:
Information Last Updated:

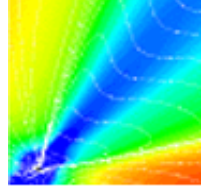
---WAITING ON INPUT---

BATS-R-US IH

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution:
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:



Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as
Input: No
Website:
Model Partners

OUTPUTS

Notes:

Information Last Updated:

---WAITING ON INPUT---

BATS-R-US SC

Purpose:

INPUTS

Model Platforms

Program Size:

Run Time:

Resolution

Temporal:

Vertical:

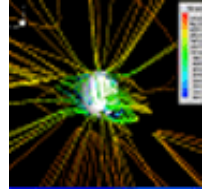
Horizontal:

Range

Temporal:

Vertical:

Horizontal:



Access to model product:

Validation:

Config Control:

POC:

Affiliation:

Email Address:

Phone #:

Funding:

Contract #:

Contract Name:

Past Funding:

Currently Use NASA Data Products as Input: No

Being Investigated for Use of NASA Data Products as

Input: No

Website:

Model Partners

OUTPUTS

Notes:

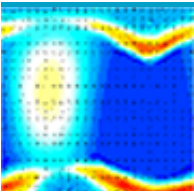
Information Last Updated:

---WAITING ON INPUT---

Purpose:

INPUTS

Model Platforms
Program Size:
Run Time:
Resolution
Temporal:
Vertical:
Horizontal:
Range
Temporal:
Vertical:
Horizontal:



Access to model product:
Validation:
Config Control:
POC:
Affiliation:
Email Address:
Phone #:
Funding:
Contract #:
Contract Name:
Past Funding:
Currently Use NASA Data Products as Input: No
Being Investigated for Use of NASA Data Products as Input:
Website:
Model Partners

OUTPUTS

Notes:
Information Last Updated:

---WAITING ON INPUT---

Open GGCM

Purpose:

INPUTS

Model Platforms

Program Size:

Run Time:

Resolution

Temporal:

Vertical:

Horizontal:

Range

Temporal:

Vertical:

Horizontal:

Access to model product:

Validation:

Config Control:

POC:

Affiliation:

Email Address:

Phone #:

Funding:

Contract #:

Contract Name:

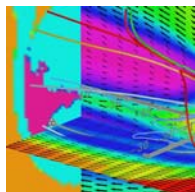
Past Funding:

Currently Use NASA Data Products as Input:

Being Investigated for Use of NASA Data Products as Input:

Website:

Model Partners



**Global
Magnetohydrodynamic
Magnetosphere**

OUTPUTS

Notes:

Information Last Updated:

—WAITING ON INPUT—

Purpose: First-principles modeling of Earth's inner magnetosphere and coupling to ionosphere

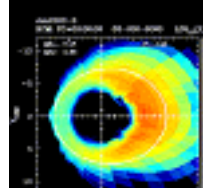
INPUTS

- Dst index
- ground based / magnetometers
- LANL / plasma
- ACE plasma detector / solar wind density and velocity
- ACE magnetometer / solar wind magnetic field
- Hilmer-Voigt / magnetic field model

Model Platforms

- Unix workstation
Program Size: 12,000 lines of code
Run Time: About 1 hr CPU time for 1 hour magnetosphere time
Resolution
Temporal: 10 minutes
Vertical: 0.2 Earth radii (RE) in equatorial plane
Horizontal: 1 RE in equatorial plane
Range
Temporal: 48 hours for typical magnetic storm
Vertical: 10 RE
Horizontal: 20 RE

Access to model product: Contact S. Sazykin (sazykin@rice.edu),
R. Spiro (spiro@rice.edu), or R. Wolf (rawolf@rice.edu)
Validation: Garner et al., JGR, 109, A02214, 2004
Config Control: Version 2004A
POC: Dr. Richard Wolf
Affiliation: Rice University
Email Address: rawolf@rice.edu
Phone #: 713-348-3308
Funding: NSF, NASA
Contract #: NAG5-11881
Contract Name: Magnetospheric storm dynamics
Past Funding: 1999-2001, NAG5-8136
Currently Use NASA Data Products as Input: Yes
Being Investigated for Use of NASA Data Products as Input: No
Website:
Model Partners



Inner Magnetosphere

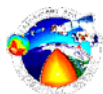
OUTPUTS

- Ionospheric potential distribution
- Ring current and plasma sheet particle fluxes
- Magnetic-field-aligned current distribution

Notes:

Information Last Updated: 3/4/2005

Earth-Sun Science Laboratories



Laboratory for
Terrestrial Physics



GSFC Laboratory for
Atmospheres



Global Hydrology
and Climate Center



Short Term Prediction
Research and
Transition Center



Community Coordinated
Modeling Center



Joint Center for Satellite
Data Assimilation



Laboratory for
Hydrospheric Processes



Goddard Institute for
Space Studies

Partner Laboratories



Geophysical Fluid
Dynamics Laboratory



Los Alamos National
Laboratory



Air Resources
Laboratory



Office of Research
and Applications



Network for Earthquake
Engineering Simulation



Pacific Northwest National
Laboratory



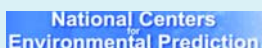
Sandia National
Laboratories



Lawrence Livermore
National Laboratory



National Center for
Atmospheric Research



National Centers for
Environmental Prediction

Suggested Reading

Hill, Chris, Cecelia DeLuca, Balaji, Max Suarez, and Arlindo da Silva, 2004. "The Architecture of the Earth System Modeling Framework". *Computing in Science & Engineering*, 6(1):18-28.

Lin, Shian-Jiann, Robert Atlas, and Kao-San Yeh, 2004. "Global Weather Prediction and High-End Computing at NASA". *Computing in Science & Engineering*, 6(1):18-28.

Donnellan, Andrea, John Rundle, John Ries, Geoffrey Fox, Marlon Pierce, Jay Parker, Robert Crippen, Eric DeJong, Ben Chao, Weijia Kuang, Dennis McLeod, Mitsuhiro Matu'ura, and Jeremy Bloxham, 2004. "Illuminating the Earth's Interior Through Advanced Computing". *Computing in Science & Engineering*, 6(1):36-44.

King, Roger L. and Ronald J. Birk, 2004. "Developing Earth System Science Knowledge to Manage Earth's Natural Resources". *Computing in Science & Engineering*, 6(1): 45-51.



Science Mission Directorate Earth-Sun System Division



This booklet is part of a series of three booklets. Please read the Satellite Missions booklet for more information on the individual missions and the Partner Decision Support Tools booklet for more information on support tools.

These booklets are derived from the **Earth-Sun Science System Components Knowledge Base** which is available on-line at

<http://www.asd.ssc.nasa.gov/m2m>

For more information please e-mail us at:

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<http://science.hq.nasa.gov>

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